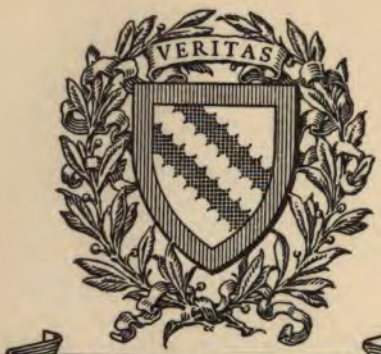

J. F. Dana's.

A

TREATISE

ON

THE ART

OF

BREAD-MAKING.

Wherein,

THE MEALING TRADE,

ASSIZE LAWS,

AND EVERY CIRCUMSTANCE CONNECTED WITH THE ART,

IS PARTICULARLY EXAMINED.

By A. EDLIN.

LONDON:

Printed by J. Wright, St. John's Square,

FOR VERNOR AND HOOD, POULTRY.

1805.

TO

BENJAMIN,

COUNT RUMFORD, LL. D. F.R. S. &c.

WHO HAS

SO SUCCESSFULLY LABOURED IN

THE APPLICATION OF SCIENCE

TO THE PURPOSES OF

COMMON LIFE,

AND, THEREBY,

INCREASED THE COMFORTS AND HAPPINESS OF

MANKIND,

THIS VOLUME IS RESPECTFULLY INSCRIBED,

BY

HIS MOST OBEDIENT,

HUMBLE SERVANT.

A. EDLIN.

PREFACE.

AT the Theatre of Guy's Hospital, in London, there is established a society of medical men, who meet once a week, during the winter season, to communicate such new facts and observations as occur in the course of their practice.—At the same time, a dissertation on some medical or philosophical subject is brought forward, and read by the members in their turn, which, after due deliberation, and an exordium from the president, is calmly investigated; when some of the lecturers, and many of the most eminent men in the profession, are frequently induced to give their opinion, for the promotion of medical knowledge, and the improvement of the students in particular, who, while they only appear to be enjoying an agreeable evening's conversation, are, in reality, laying up a treasure of useful knowledge.

Such is the origin of the present per-

formance, wherein I have endeavoured to investigate more fully the nature and properties of wheat, and to develope the causes which produce fermentation in farinaceous substances. At first sight, such an enquiry, from its novelty, appears trivial; yet, unimportant as it may be deemed, I trust it will not be found totally void of interest, or unworthy of elucidation.

With a view of giving as much perspicuity as may be in my power to a subject so complicated, I commence with the natural history and cultivation of wheat. The manner of preserving and grinding the different sorts of corn into flour will next be treated of. The analysis and synthesis of wheat flour then comes to be considered, and, that ascertained, I proceed to detail several experiments, which appear to elucidate the nature of yeast, and, by combining its constituent principles with the saccharine extract of flour, endeavour to unfold the mode by which fermentation in bread is produced.

After

After giving such an idea of that interesting process, as, from a variety of experiments, appear to me the most reasonable, I pass on to the several preparations of bread, dividing them into three kinds, and offering such observations upon each, as the nature of the subject naturally gives rise to. Next follow a few remarks on the structure of a bake-house, and several approved methods for generating and preparing of yeast, which may be made with facility in the most remote corners of the globe. And, finally, will be detailed, a connected view of all the laws at present in force respecting the manner of regulating the assize of bread, both in town and country.

If it should be asked, for whose use is such a work designed? I answer, for every one whose curiosity would lead them to study a beautiful and interesting branch of experimental philosophy. To the frugal housewife, who would enjoy the luxury of eating good unadulterated bread, such directions are given, that,

with very little labour and trouble, she may soon learn to grind her own wheat, separate the flour from the bran, and make it up and bake it into bread. To captains of ships, to military men, and such who travel into unfrequented regions, where, if any bread is to be procured, it is in general execrable, such plain and easy instructions are laid down for making good bread, as cannot fail of being easily put in practice. Even the baker, whose habits and education do not lead him to investigate speculative doctrines and opinions, may find several observations that will prove serviceable in the prosecution of his business, particularly the abstract and tables of the assize laws, which, being derived from authentic sources, will preclude the necessity of his consulting a variety of acts of parliament, which, unless carefully digested, appear to contradict one another.

To scientific men there will be found but little information in this volume, that was

was not well known before; but they will observe, that the multifarious subjects connected with the art, have been arranged and brought forward in a popular and intelligible form, in order that the subject may be clearly and distinctly understood by persons unacquainted with chemistry and chemical authors; and I trust such a view has been given of the art, that if every baker's apprentice, throughout the United Kingdom, was to be presented with a copy of this little book on signing his indentures, he would thereby attain a better and more scientific view of his business than he could possibly learn in a whole life of illiterate practice, by following the old routine, which passes without improvement from one generation to another; and thus a new order of men would arise, who, by filling up the imperfections, and correcting, by practice, the errors herein, would have the satisfaction of establishing the art on a solid foundation, and thereby render their business truly respectable.

Impressed with this sanguine hope, I anticipate the period when we shall see the art of bread-making, instead of forming a confused and unintelligible article in our encyclopædias and dictionaries, attain its proper rank among the liberal sciences.

Uxbridge,
16*th Jan.* 1805.

ADVERTISEMENT.

THE Author is sensible that, in a work which embraces such a variety of objects, many errors and imperfections will be found: a circumstance almost unavoidable, where the necessary information, which is widely scattered, was to be collected and compressed from almost numberless volumes, and brought into such a point of view, so far divested of scientific terms, as to be comprehended by the bulk of mankind.

In an undertaking of this kind, he trusts that the candour and liberality of the public will pardon the defects that must manifestly appear in this attempt

to raise the art of bread-making from the mystery and obscurity that hath hitherto involved it, to a science that may be learned by any person of moderate abilities; and although incomplete, he considers the foundation as laid, which future acquisitions may, from time to time, establish, and thereupon rear a beautiful structure, that will stand the test of ages.

With this view, he begs leave to solicit any new facts, or observations, that may occur to his readers, not merely as to correcting the errors, but also hints for any new or improved method of grinding flour, or making bread; which, if communicated to the publisher, will be thankfully received and attended to, should another edition be ever required.

He

He also begs leave to observe, that since these papers have been ready for the press, it has been suggested that the subject might be rendered more complete, by instituting a series of experiments similar to those of Dr. Stevens, and the Abbé Spallanzani, to determine what preparations of bread are most easy of digestion, and consequently most proper for the nourishment of mankind.

It has likewise been hinted, that an analysis of the other farinaceous grains in common use, ought to be made, in order to render our reasoning, on those points, more correct. The former idea had suggested itself, and he had made some progress in that enquiry, but his other avocations not permitting him to pay sufficient attention to the subject,

he

he reluctantly abandoned it. But, should the present volume be favourably received, he shall consider it as his duty to prosecute those enquiries, and give a brief account of them, when the experiments on which they will be founded are sufficiently correct to meet the public eye.

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A TREATISE

ON

THE ART OF BREAD-MAKING.

CHAP. I.

OF THE NATURAL HISTORY AND CULTIVATION OF WHEAT.

SECT. I.

WHEAT is an annual plant, rising erect from the ground, belonging to the triandrious* class, and ranking under the order digynia.

2. As it is a vegetable that has small narrow leaves, and few in number, it depends mostly on the soil it grows in for its nourishment†, and little on the air‡.

3. That it draws the whole, or at least the greatest part of its support from the earth, is probable, as the leaves, from being dry and withered, lose their power of absorbing food during the ripening of the seed, and as it is only cultivated for its seed, and not cut down till that

* Linn. Gen. Plant. No. 94.

† If a grain of wheat is put on cotton, and moistened with pure water, it will produce an ear of corn the same as if it had grown in the earth, but instead of producing a hundred fold, that ear will only contain one single grain.

2d. Young's Annals, 487.

‡ This is very different from the cabbage, which has broad expanding leaves, and a multitude of them, and owes its increase more to the air than the soil.

that seed be fully ripe, it may be pronounced a robber* of the land.

4. When young, it is all leaves, but soon after impregnation the plant becomes stationary, the leaves wither, the roots cease to push forth fresh fibres, and, when cut down, it is bleached and sapless.

5. Its growth is stopped long before reaping, and the ground, for want of motion†, becoming compact, hard, and dry, causes the dew which falls on the crop to rest on the surface, and is absorbed by the morning sun.

6. Of all the culmiferous plants, this is the most destructive to the ground, from the great length of time it occupies it without admitting the plough; but as this grain is heavier than either barley or oats, it probably requires more nourishment than either; but, on the other hand, it is more profitable to the farmer, although few soils can long bear the burthen of such crops, unless relieved by fallows.

It

* Encyclop. Brit. vol. 1, p. 308.

† "This is not the general practice in all situations, for on those lands where the drill husbandry is adopted, hoeing is an essential part of that culture, and in the vale of Gloucester, notwithstanding wheat is sown broad-cast, yet it is universally hoed. The first hoeing is begun in April, and the latter one as late as the plants will admit, without injuring them. The advantages of the crop are, that the seed-weeds are cut off, the root-weeds checked, and the crust of the soil broken. By thus giving the roots a full supply of air, and the plants themselves the full possession of the surface, they acquire a vigorous habit, and are induced to branch out and spread over the surface, and fill up every vacancy; by that means increasing their own strength, and keeping their enemies under."

Marshall's Rural Œcon. of Gloster. vol. i. p. 121.

7. It is not known, with any degree of certainty, to what country we are originally* indebted for wheat, but when we reflect that it furnishes man, in most civilized countries, with a very considerable portion of his food, it is a happy circumstance that it can accommodate itself to such great variety of climates. Hence it is found in all Europe; in Egypt, and throughout Barbary, that is to say, in all the most populous parts of Africa; in Mexico, in the most flourishing provinces of Peru, and in those of North America. Wheat is also the food of man in many parts of Persia, Hindostan, and even in China, a rice country, wheat is in daily use in three of its provinces.

8. It is scarce necessary to observe, that a clayey soil answers best for wheat; but it is not worth any thing till its texture is loosened by a mixture of marl, ashes, or coarse sand, which destroy the cohesion of its parts, and open the soil to admit the influence of the sun, the air, and the frosts.

9. Besides these articles, lime† is also of considerable use as a manure, from its rendering the clay less cohesive, and destroying, in a short time, dead vegetable fibres, and thus reducing them to earth, which would otherwise have been effected by a very slow process, either by the consumption of insects, or by a gradual putrefaction.

10. Wheat, from land well limed, is believed, by

* Tissot's Essay on Bread-Corn and Bread, p. 18.

† Darwin's Zoonomia, vol. 2, p. 672.

by farmers, millers, and bakers, to be thinner skinned, and consequently produces more flour, and less bran.

11. Some farmers, when they use lime, spread it on the ground as it comes from the kiln; but it is a much better practice to sprinkle it with water while it lays in heaps, as it then breaks the lime into a very fine powder, and is afterwards more intimately blended with the soil.

12. It is usual, before the seed is committed to the earth, to let the land lay fallow* for some months: the proper time to commence this operation, is about the latter end of April, or the beginning of May, while the ground has some remaining moisture.

13. It is then plowed and harrowed several times, in order to destroy the contexture of the parts; by these operations the ground is partly reduced to powder, many of the roots of vegetables, with which it always abounds, are dissolved and putrefied, and the mould produced from them mixes with the rest, as well as the effluvia emitted during their dissolution.

14. The earth soon begins to exert its prolific† powers, and a fresh crop of vegetables‡ is again produced;

* "That the spent earth may gather heat again,
And, better'd by cessation, bear the grain."
Dryden's Virgil, Georgic 1, l. 108.

† I do not mean to assert that the earth itself is prolific, but that cultivation furnishes a matter which serves for the food of the future plant. For an explanation of this opinion, see a most excellent essay on the food of plants and manures, by Mr. Kirwan.

‡ "Then spring the living herbs, profusely wild,
O'er all the deep green earth, beyond the power
Of botanist to number up their tribes."
Thomson's Spring, l. 220.

produced; by a repetition of plowing, these are turned with their roots upwards, and exposed to the solvent powers of the air, in consequence of which they die, are putrefied, and more of the natural soil is reduced to a powder, and mixed with them. By a frequent repetition, the soil becomes more tender, approaches to the nature of garden mould, and its fertility is thereby considerably increased.

15. Before the last plowing, a coating of manure is laid on, which is then spread, and incorporated with the soil without delay*; for when it lies in a heap for two or three weeks, some of the moisture is imbibed into the ground, more passes off by evaporation, and the spots where it has lain produce tufts of corn more vigorous† than in the rest of the field, while the remainder will prove nearly useless‡.

16. In this state it lies till seed-time, when it is again

* "This last plowing has several good effects—it mixes effectually the soil and the manure, cuts off and pulverises the upper surface of the furrows of the second plowing, and, by doing this, most effectually eradicates or smothers such weeds as had escaped before, and, at the same time, by excluding the air from the under parts of those furrows, renders the whole as mellow and friable as possible."
Marshall's Rural Œcon. of Norfolk, vol. 1, p. 206.

† That is, it grows rank, running up to straw, and producing diminutive ears.

‡ To prove this to be the case, let a pound of good dung be infused in half a gallon of boiling water, and it will make a strong, pungent, and high-coloured liquor; whereas, if, after remaining on the ground for some time, especially if the weather be hot and dry, and then infused, the liquor will be hardly coloured, and almost tasteless.

again plowed*, harrowed, and gathered up into ridges of such width as is agreeable to the nature of the soil, or the skill and fancy of the farmer.

The

* " The mellow'd soil, imbibing fairer hues,
Or sweets from frequent showers, and evening dews;
That summon from their shed the slumb'ring ploughs,
While health impregnates ev'ry breeze that blows.
There, unassisted, through each toilsome day,
With smiling brow, the plowman cleaves his way,
Draws his fresh parallels, and, wid'ning still,
Treads slow the heavy dale, or climbs the hill:
Strong on the wing his busy followers play,
Where writhing earth-worms meet th' unwelcome day;
Till all is chang'd, and hill and level down
Assume a livery of sober brown;
Again disturb'd, when Giles, with wearying strides,
From ridge to ridge the pond'rous harrow guides;
His heels deep-sinking every step he goes,
Till dirt usurps the empire of his shoes.
Welcome green headland! firm beneath the feet;
Welcome the friendly bank's refreshing seat;
There, warm with toil, his panting horses browse
Their shelt'ring canopy of pendant boughs;
Till rest delicious chase each transient pain,
And newborn vigour swell in every vein.
Hour after hour, and day to day succeeds,
Till ev'ry clod and deep-drawn furrow spreads
To crumbling mould, a level surface clear,
And strew'd with corn, to crown the rising year;
And o'er the whole Giles once transverse again,
In earth's moist bosom buries up the grain.
The work is done; no more to man is given;
The grateful farmer trusts the rest to heaven.
Yet oft with anxious heart he looks around,
And marks the first green blade that breaks the ground."

Bloomfield's Farmer's Boy. Spring, v. 63.

17. The seed is now selected, steeped in some brine*, which is thought to prevent the smut, and afterwards sowed, harrowed in, and a roller passing over the whole, terminates the husbandman's labour† for a season.

18. It is worthy of remark, that the seed should be deposited in the earth about two‡ inches deep, for if deeper, the grain will perish, by lying in stagnating water, or be starved for want of food, and the beneficial influence of the sun and air: whereas, if it is only cast on the surface, it will be thrown out of the ground by the frosts, and thereby perish. The knowledge of this circumstance only ought to induce farmers to introduce the drill-plough where the land is adapted to it.

19. When the seed begins to vegetate§, the farinaceous

* In some counties, particularly Norfolk, it is the usual practice to steep the seed in brine, and afterwards candy it with lime. The method is, instead of dissolving the salt in a large proportion of water, to use barely enough to bring on the solution, and with this liquid salt the lime is slaked, and with this saline preparation, in its hottest state, the wheat is candied. Marshall's Rural Œcon. of Norfolk, vol. 1, p. 213.

† "Be gracious, Heaven! for now laborious man
Has done his part. Ye fost'ring breezes blow,
Ye soft'ning dews, ye tender showers descend,
And temper all."——————

Thomson's Spring, l. 48.

‡ Cooke's Drill Husbandry improved, p. 38.

§ "Three things are necessary to its growth, heat, water, and air; heat is the general cause of fluidity, without which no motion can exist; water is the menstruum in which the nutriment of the vegetable is conveyed to its various organs, and the oxygen of the atmosphere is believed to afford the

rinaceous matter is converted into sugar*, the embryo swells†, and the radicle pushes downwards, and breaks out into fibres, which branch out in different directions‡, in quest of nourishment

principle of excitability, so perpetually necessary to all organic life, and which renders the living fibres so obedient to the stimuli which are naturally applied to them; whence we may, in some measure, comprehend a difficult question, why the plume should ascend, and the root descend, which has been ascribed to mysterious instinct. The plumule is stimulated by the air into action, and elongates itself where it is thus most excited, and the radicle is stimulated by moisture, and elongates itself thus where it is most excited; whence one of them grows up in quest of its adopted object, and the other downwards."

Darwin's Phytologia, Sect. 9.

* Fordyce's elements of Agriculture, p. 10.

† In situations where rooks are numerous, it is necessary to watch the new-sown fields for some days, as the havoc they occasion is inconceivable. They search out the lands where grain is sown, and watch them more carefully than their owner, and as soon as they perceive it begins to shoot, commence their depredations, and, in three or four days, will root up such vast quantities, that a good crop has thus been destroyed in embryo; but as soon as the green blades appear above ground, the danger is over, for then the seeds are so far robbed of their mealy substance, as to be no longer a palatable food for the rook. In order to watch them properly, every time a flock settles, the person employed should throw up a dead rook, and they will immediately quit the field. The reason of their rising at the tossing up of their dead fellow-creature is, that they are a bird extremely apprehensive of danger, and they are always alarmed when one of their comrades rises, as they take this for the rising of an out bird, and all fly off at the signal." Encyclop. Londin. vol. 5. p. 241.

‡ These are afterwards succeeded by a fresh set, when the seminal roots die, a process termed tillering.

rishment, the plumule* appears above ground, and, rising upwards, bursts through the sheath which encloses it, when a single leaf makes its appearance; in a few days it unfolds itself, and another is produced; soon after a knob or swelling is observed, when the stem throws off branches in every direction.

20. In some luxuriant soils, especially after a mild winter, it is very apt to grow rank, and shoot too much to straw. In such case it is necessary to eat it down with sheep†, otherwise the ears will be few, and the grain small and shrivelled. This practice causes the wheat to branch out into a greater number of stalks than it would otherwise do, and of course the crop is increased, and the grain rendered heavier‡; besides the treading of the sheep fixes the

* "Come, ye soft sylphs! who sport on Latian land,
Come sweet-lipp'd Zephyr, and Favonius bland!
Teach the fine seed, instinct, with life to shoot
On earth's cold bosom its descending root;
With pith elastic stretch its rising stem,
Part the twin lobes, expand the throbbing germ;
Clasp in your airy arms th' aspiring plume,
Fan with your balmy breath its kindling bloom.
Each widening scale and bursting film unfold,
Swell the green stalk, and tint the ear with gold;
While in bright veins the silvery sap ascends,
And refluent blood in milky eddies bends.
While spread in air, the leaves respiring play,
Or drink the golden quintessence of day."
Darwin's Botanic Garden, vol. 1, p. 194.

† Bath Society Papers, vol. 1. p. 66.

‡ "And lest the stem, too feeble for the freight,
Should scarce sustain the head's unwieldy weight,

the earth about the roots of the corn, and causes the ground to retain its moisture longer. It will be necessary, however, to turn them into the field hungry, and take them out as soon as they have filled their bellies, for when hungry they will eat the leaves of the plant, but when their hunger is satiated, they will pick out the knob or crown of the plant, that being the most sweet and delicate, and thereby occasion its death.

21. As the spring advances, the stalk rises perpendicularly upwards, but grows slowly till about four or five feet high, in order to preserve* the future ear from being destroyed by the moisture of the ground.

22. The height of the stalk contributes likewise to the depuration of the nourishing juices which the root† conveys to it, and its round form assists this operation, for by that means the heat penetrates equally into every part of the stem.

Sends in his feeding flocks, betimes t' invade
The rising bulk of the luxuriant blade."
Dryden's Virgil. Georgic 1. l. 164.

* Sturm's Reflections, vol. 1. p. 273.

† "In order to shew in what manner the absorbent vessels of the roots of plants imbibe their nutriment from the moist earth, water a plant with decoction of madder or logwood, then cut off a twig or two, when an internal circle of red points appear which are the ends of the absorbents, while an external ring of arteries is seen to bleed out a milky juice, which evinces the existence of both an absorbent and an arterial system. The absorbents forming a ring in the sapwood beneath the bark, while a ring of arteries is situated exterior to it."
Darwin's Phytologia, sect. 1.

But

23. But how is it possible that so slender a stalk can bear up its fruitful head without sinking under its weight, or without being beat down with the wind and rain? This inconvenience is guarded against in the peculiar formation of the stem, which is furnished with four strong knobs which give strength, without destroying its flexibility or power of bending; besides, at every knob or joint a saccharine matter is deposited for the purpose of nourishing the ascending part of the young stem, and in the uppermost joint it serves instead of honey for the stamens and stigmas, as their flowers have no visible nectary.

24. From out of the chief stem there shoots out others not so high, as well as leaves, which, collecting drops of dew and rain, are absorbed and serve to dilute the nutritive juices which would otherwise be inspissated by the scorching rays of the sun.

25. After all these preparations the blossom appears, the bud is observed between the two upper leaves of the stalk, and from the centre of the germen are protruded two* little pillars, which are hollow within and pointed at the top; these are called pistils, by botanists, and are considered as the female part of the flower; round these arise three capillary filaments called stamens, or the male organs, crowned with oblong bifurcated boxes, termed anthers†, studded

* Linn. Gen. Plant. No. 94.

† "So shall from high the bursting anther trust,
To the mild breezes the prolific dust;

ded with a delicate buff-coloured powder, every particle of which Linnæus assures us is a globe, which being deposited by the wind upon the feathered stigma or head of the pistil, bursts* and deposits a prolific liquid, which being absorbed, stimulates the embryo, and gives vitality to the seed†. As

Or bow his waxen head with graceful pride,
Watch the first blushes of his waking bride,
Give to her hand the honey'd cup, or sip
Celestial nectar from her sweeter lip;
Hang in soft raptures o'er the yielding fair,
Love out his hour, and leave his life in air."
Darwin's Botanic Garden, vol. 1. p. 197.

* Linnæus's dissertation on the sexes of plants, p. 27.

† The process of impregnation, notwithstanding the enquiries of many learned and ingenious men, still remains and will probably continue a disputed point among physiologists. Dr. Darwin considers the seed as a sexual offspring, produced principally by the male part of the flower, and received into a proper nidus, and supplied with nutriment by the female part of it; thus claiming both a father and a mother. Linnæus, on the other hand, conceives the seed to be originally formed by the mother, and that it is vivified by the stimulus of the prolific dust of the father, and in support of this opinion brings forward, in his dissertation on the sexes of plants, a number of beautiful and accurate experiments, which the ingenious but futile reasoning of the Abbé Spallanzani has not been able to confute or overturn. For if the seed is principally produced by the male part of the flower, how comes it to pass that it is found evolved in the uterus of the mother, to all external appearance perfect before the anthers are capable of impregnation: and what is the reason that abortion follows, if they are artificially removed? To set this matter in a clearer point of view, I shall beg leave to relate the following simple experiment, and if we allow the result it affords to guide us in our determination, it must clearly appear

26. As soon as the nuptial rites are celebrated, the organs of procreation become brown, fade, and

appear that Linnæus's opinion, so far from being injured by controversy, will only be established on a more solid foundation. Take any hermaphrodite plant just coming into bloom, (a stock for instance,) let all the flowers except one or two be cut off, then examine these carefully, and there will be found an exterior part called the calyx, consisting of four green leaves; within this is the coloured part or corolla, composed of four petals; in the centre of the corolla is one pistil, or the female part of the flower, long and cylindric (containing the embryos of several seeds) and ending in a very short style, that terminates in an oblong stigma, divided into two parts. Round the female arise six stamens, or the male part of the flower, two of which will be perceived shorter than the rest; on the top of each stamen is a little vessel called the anther, containing the pollen or impregnating powder, which, when the flower is fully blown, is discharged upon the stigma, where it adheres by means of the dew of that part, and the moisture occasions its bursting, by which means its contents are discharged, and what issues from it is absorbed and mixed with the fluid of the stigma, and conveyed to the rudiments of the seed, which are thereby rendered prolific.—We now wait till the corolla withers and falls off, which it does pretty soon, and then remark what becomes of the pistil, composed of the style, the germ, and the stigma.—The germ grows considerably in length, and thickens a little as the seed ripens; when ripe it becomes a kind of flat pod, composed of two valves, each covering a small cell, and the cells are separated by a thin partition. When the seed is ripe, the valves open from the bottom upwards to give it passage, and remain fast to the stigma at top, when you may see the flat round seeds ranged along each side of the partition. Having satisfied ourselves with this examination, we may next proceed to interrupt the process of nature, by removing, with a pair of fine forceps, the six anthers, upon the first opening of the petals, the consequence will be that the seed, if the plant has no communication with others of the same species, will never come to perfection

and fall off. To preserve such tender connexions from the accidents and dangers which might destroy them at the instant of their birth, the two upper leaves of the stalk unite closely at the top, both to preserve the ear* of corn, and to draw to it the nourishing juices; but as soon as the stem is formed enough to supply the grain itself with nourishment, then this sheath or vaginal coat gradually dries, and drops off, that none may be taken from the fruit, and that the root may have nothing more than necessary to nourish.

27. When this scaffolding is removed, the edifice appears in full beauty; refreshed with gentle rains, the ear increases in size, the mealy substance is secreted†, and when the fruit has attained

perfection, but will be found dry and shrivelled, and if it is sown in the earth will prove barren. From this well known fact, it is evident that the seed cannot be perfected without the assistance of the father, and if he refuses the nuptial embrace, barrenness must inevitably follow.

* "Shot up from broad rank blades that droop below,
The nodding wheat ear forms a graceful bow,
With milky kernels starting full weigh'd down,
Ere yet the sun hath ting'd its head with brown."
Bloomfield's Farmer's Boy. Summer, v. 51.

† It is worthy of remark, that if a berberry plant is suffered to grow near a wheat field, that it will materially injure the crop by checking the process of secretion. In order to ascertain this fact, Mr. Marshall planted one in the middle of a large piece of wheat; little notice was taken of it till the wheat was changing, and the rest of the field had acquired a considerable degree of whiteness, while about the berberry plant there appeared a long but somewhat oval shaped stripe of a dark livid colour, the part affected resembled the tail of a comet, the bush itself resembling the nucleus; on one side it reached about twelve yards, but on

tained its full growth, the stalk whitens, the greenish* colour of the corn becomes of a golden hue, and at last sinks under the weight of its riches, and bends its head of itself to the sickle.

28. When these appearances take place, it should be reaped† as early as possible, and bound

on the other not more than two, the tail pointing towards the S. W. so that probably the effect took place during a N. E. wind. At harvest the ears appeared slender, shrivelled, and light; ten grains chosen impartially out of the ordinary corn, took twenty-four of the berberried grains, chosen equally impartially, to balance them. To try if the vegetating faculty of these grains was destroyed or not by the damage the farinaceous part of them had received, Mr. M. sowed some of them in a garden pot, and they did vegetate, which shows, that notwithstanding the injury done to the farinaceous part of these grains, that their vegetative power was not wholly destroyed. There is reason to believe that this process of secretion continues for some time after the grain is carried into the barn or granary, which occasions old wheat to produce more and better flour for the baker.

* "Its dark green hue, its sicklier tints all fail,
And ripening harvest rustles in the gale."
Bloomfield's Farmer's Boy. Summer, v. 113.

† "Here midst the boldest triumph of her worth,
Nature herself invites the reapers forth,
Dares the keen sickle from its twelve month's rest,
And gives that ardour, which in every breast
From infancy to age alike appears
When the first sheaf its plumy top uprears.
No rake takes here what heaven to all bestows,
Children of want for you the bounty flows!
And every cottage from the plenteous store
Receives a burden nightly at its door.
Come health! come jollity! light footed come;
Here hold your revels, and make this your home.

Each

bound up directly into sheaves, as it is apt to get discoloured by laying on the ground. The sheaves are commonly made as large as can be contained in two lengths of the corn made into a band; these sheaves are then gathered into shocks, five sheaves on each side make a sufficient stay, and are usually directed towards the south-west, in order to resist the force of the wind.

29. After remaining in this state for about four days, more or less according to the state of the weather, it is carted* and conveyed to the stack yard,

Each heart awaits and hails you as its own;
Each moistened brow, that scorns to wear a frown:
Th' unpeopled dwelling mourns its tenants stray'd;
E'en the domestic laughing dairy maid
Hies to the field, the general toil to share;
Meanwhile the farmer quits his elbow chair,
His cool brick-floor, his pitcher, and his ease,
And braves the sultry beams, and gladly sees
His gates thrown open, and his team abroad;
The ready group attendant on his word,
To turn the swath, the quiv'ring load to rear,
Or ply the busy rake the land to clear."
Bloomfield's Farmer's Boy. Summer, v. 131.

* ——————— "Meanwhile
The gleaners spread around, and here and there,
Spike after spike, their scanty harvest pick:
Be not too narrow, husbandmen! but fling
From the full sheaf, with charitable stealth,
The liberal handful. Think! oh, grateful think!
How good the God of harvest is to you,
Who pours abundance o'er your flowing fields,
While these unhappy partners of your kind
Wide hover round you like the fowls of heav'n
And ask their humble dole. The various turns

Of

yard, when the sheaves are placed upon pedestals,* with the ears inclining towards the centre, and, built up into a stack. This practice is considered, by many professional men, as superior to housing, the grain not being so liable to become musty as when shut up in a barn, besides it is more effectually secured from vermin.

30. As soon as the stack is built, it should be covered with a thatch of straw, and bound with withes of the same material, to defend it from the inclemencies of the weather.

31. After remaining in this situation for some time, in order that the seed may become hard and fit for threshing, the corn is beat out from the ears with a flail upon the barn floor, the chaff is separated with the fan or winnowing machine, and the grain is measured into five bushel sacks, and sent to market, where it is sold, either in bulk or by sample, to the mealmen, who afterwards carefully store it in their granaries, where it remains till the demands of the baker cause it to be removed to the mill, in order to its being ground into flour.

CHAP.

Of fortune ponder; that your sons may want
What now, with hard reluctance, faint, ye give."
Thomson's Autumn, l. 165.

* These pedestals should have a coveing to come six inches out, which will effectually prevent rats and mice from getting up the stack.

CHAP. II.

OBSERVATIONS ON THE MEALING TRADE.

SECT. I.

THE corn trade of Great Britain, both as a manufacture and an article of commerce, is, above all others, the first in importance to the welfare and prosperity of the kingdom; and parliament, in order to encourage it, have, at different periods, enacted a number of laws for the better carrying on and regulating the same; but as a particular detail of this trade would necessarily lead me into an extensive and complicated field of discussion, which has already been most ably investigated by Mr. Dirom, and the late Dr. Adam Smith, I shall therefore proceed to what more materially concerns my present subject, by observing that the principal corn market* in the kingdom is the Corn Exchange, in Mark-Lane. To this great mart

* About forty or fifty years ago, the dealers in corn carried on their trade at Bear Quay, but finding it, on many accounts, extremely inconvenient, the Corn Exchange in Mark-Lane was erected, by a company of proprietors, for the accommodation of the factors and dealers, the estate being managed by a committee of three trustees, chosen by the proprietors, who have allotted seventy-two stands, on which the samples of corn are exposed for sale; sixty-four of these stands are let out on lease to factors or dealers, and the remaining eight are appropriated to the use of the Kentish hoymen. "Although the Corn Exchange is considered as open to all who come to buy and sell, yet no person.

mart of merchandize, the farmers and corn-merchants send, every Monday and Friday morning, samples of the stock they have on sale, tied up in little bags, with a label on each, stating the number of quarters, and where they are deposited. These samples are consigned to brokers, who are called corn-factors, and who have each a stand on the exchange, on which the bags are placed for the inspection of the buyer. Here the millers, mealmen, and corn-chandlers, who come from all parts of the country, transact their business with the corn-factor, and not with the seller, who has a commission, from the seller, of one shilling per quarter, for selling foreign wheat, and sixpence per quarter for all that comes coastwise, and the buyer has also one penny per quarter to pay a corn meter, who undertakes to examine the bulk, and see that it corresponds to the sample, and then, if the buyer is satisfied, he engages to clear it, and pay for it in a month; but if the corn-meter gives him notice that the bulk is not answerable to the sample, then there is no compulsion on him to complete his purchase. A latitude of this kind is extremely necessary, and saves the buyer a great

son can carry on the business of a corn-factor, to any considerable extent, unless he is in possession of one of these stands. Here the factors are at liberty either to expose all their samples at the same time, or as few of them as they think fit; so that a buyer has no means whatever of judging, from the appearance of the samples exposed on the stands, during any period of the market, what the supply is, or what quantities of corn are imported, coastwise or from abroad." Report of the Committee of the House of Commons respecting corn.

great deal of trouble, as sometimes the ship does not arrive at Bear Quay for a week or ten days after the cargo is sold.

2. Besides the Corn Exchange, there are established, in many country towns, weekly markets, where the farmers cause their corn to be pitched in bulk, or bring their samples in bags. At these markets the millers and mealmen resort, who transact their business immediately with the farmer, without the interference of a broker, and the corn is from thence removed to the granary, where it undergoes a particular management.

3. These granaries are very extensive buildings, from three to six stories high, every story forming one apartment, where the new grain is deposited, as in this state it is unfit to grind into flour. The dimensions of these apartments are, in general, from sixty to ninety feet in length, from forty to sixty feet in breadth, and from six to nine feet high. To support the great extent of the floor, and such a weight of grain, there are several very large and solid wooden pillars placed in every room, which pass from top to bottom, and every apartment is also furnished with windows, which are opened in dry weather, for the benefit of ventilation.

4. With respect to the management of corn in these granaries, the following are the means that experience has pointed out for its preservation. In the first place, it is turned* out of the sacks, and tossed about with shovels, from one end of the

* Encyclop. Londin. vol. 5. p. 206.

the floor to the other, the corn only being carried from side to side, or end to end, while the dust, and other impurities, fall down in the middle of the room, and are swept away.

5. After this it is passed through a screen, and spread on the floor, about half a foot thick; it is then turned about twice a week, and once a week the screening is repeated. This sort of management is continued about two months, and after that it is laid about a foot thick, for two months more, and in this time they turn it once a week, or twice if the season be damp, and now and then screen it again. After about five or six months, it is raised to two feet thickness in the heaps, and is only turned once or twice in a month, and screened as there appears occasion. After a year, it is laid two feet and a half or three feet deep, and turned over once in three weeks or a month, and screened proportionably. When it has lain two years, or more, it is turned once in two months, and screened once a quarter; and how long soever it is kept before it is ground, the oftener the turning and screening are repeated, the better the grain will be found to keep. Corn has, by these means, been preserved in the granaries of this country for upwards of thirty years, and it is observed that the longer it is kept, the more flour it yields in proportion to the corn, and the purer and whiter the bread is, there being nothing but the superfluous humidity evaporated in keeping.

6. In some parts of the continent, instead of throwing the corn about with shovels, from one side

side of the floor to the other, as is practised in this country, they turn it out and winnow it frequently, or pour it through a trough or mill-hopper, from one floor to another. Being thus aired and preserved from all impurities, for the space of two years, and having all its heat* and moisture exhaled, it is lodged in pits, and the heap, being covered with quick lime, is afterwards sprinkled over with a small quantity of water, which causes the grain to shoot to the depth of two or three fingers, and encloses it with an incrustation, through which neither air nor insects can penetrate, and the pit is afterwards covered up with strong planks, joined together. In this way corn may be preserved for fifty or even an hundred years.

7. The public granaries at Dantzic are seven, eight, or nine stories high, having a funnel in the midst of every floor, to let down the corn from one to another; they are built so securely that though every way surrounded with water, the corn contracts no damp, and the vessels have the convenience of coming up to the walls for their lading.

8. The Russians preserve their corn in subterranean granaries of the figure of a sugar loaf, wide below and narrow at the top, the sides are well plastered, and the top covered with stones. They are very careful to have the corn well

* An attention to this circumstance is indispensibly necessary, for if the heap is suffered to acquire any considerable degree of heat, the grain will acquire a musty smell, and give a most unpleasant taste to the bread.

well dried before it is laid into these store houses, and, as the summer is short, they frequently find it necessary to dry it in an oven first.

9. At Geneva* there is a very spacious public granary, where corn is collected and deposited from different parts of France, Barbary, and Sardinia; while it continues new it is turned over at least once in twenty days, but when the grain becomes sufficiently firm and quite dry, which it generally does in two years, it is then moderately and skilfully kiln-dried, and then the lowest flat of the granary is stored with as much grain as can be packed or heaped in it, and the quantity is gradually diminished as they rise to the upper stories, for the obvious purpose of saving labour and expence. By this method of management they have experience of preserving the grain in perfect soundness for many years.

10. It is a circumstance worthy of observation that a thunder† storm will materially injure corn thus prepared, and render it for a time perfectly unfit for use, and although it might be dry and fit for grinding, yet after the storm is over it will be found clammy and sticking. In this case there is no remedy but the turning of all such corn three or four times a day for two months longer, in which time it will generally come to itself, though sometimes not.—This effect of thunder and lightning is only observed to take place in such corn as is not a year old,

* Lord Gardenstone's Travelling Memorandums, p. 175.

† Encyclop. Londin. vol. 5. p. 207.

old, or has not sweated sufficiently in the straw before it was threshed out. The latter inconvenience is easily prevented by a timely care, but as to the former all that can be done is carefully to examine all stores of last year's corn after every thunder storm, that if any of this has been so affected it may be cured in time, for a neglect of turning will certainly destroy it.

11. The preservation of corn from the ravages of insects, which sometimes reduce it to a pile of dust, is best effected by timely and frequent screening, by ventilation, by taking care that it is lodged dry, and by rubbing the floors with garlic and dwarf elder, whose strong odour may drive them away; for whether the damage arise from the weevil, the moth, or the beetle, that damage has ceased at the time the vermin make their appearance under either of these species, they being, when in this last state of existence, only propagators of their respective kinds of vermiculi, which, while they continue in that form, do the mischief. In this state they eat little, their principal business being to deposit their eggs, which unerring instinct prompts them to do where large collections of grain furnish food for their successors while in a vermicular state. It is therefore the business of industry to prevent future generations of these ravagers, by destroying the eggs previous to their hatching, and this is best accomplished by frequent screening and exposure to draughts of wind and fresh air. By frequent stirring, the cohesion of the grain with their ova is broken, and

and the nidus of those minute worms is destroyed, which, on hatching, collect together, and spin or weave numerous nests of a cob-web-like substance for their security. To these nests they attach, by an infinity of small threads, many grains of corn together, first for their protection, and afterwards for their food. When their habitations are broken and separated by the screen, they fall through its small interstices, and may easily be removed with the dust. Those that escape an early screening may be destroyed by subsequent ones, while the grain is but little injured, and the corn will acquire thereby a superior purity; but by inattention to this circumstance, and sometimes by receiving grain already infected into the granary, these vermin, particularly the weevil, will, in a short time, spread themselves in that state every where upon its surface, and darken even the walls by their number.

13. When the grain is sufficiently cured, it is sent to the mill to be ground into flour; if it is wheat, and is designed for the purposes of making bread, it should be plump, of a clear transparent amber colour, with a thin* skin, should feel heavy in the hand, and be of a sweetish taste, and when masticated some time in the mouth, a considerable portion of a thick glutinous matter, free from the meal, will be left behind; such grain will, if not too new, grind down into an impalpable

* If the skin is opaque, thick, and tough, it will produce much bran and but little flour.

impalpable powder, and produce a flour of the most delicate whiteness.

14. On examining the grain more accurately, an outside coating may be peeled off, which is the bran; immediately under it is that part of wheat which forms the coarse flour: this is of a soft nature, and is not capable of being easily reduced to powder: this substance constitutes about one half of the grain, is of a sweetish taste, and, if taken alone, with difficulty ferments and rises with leaven or yeast. The kernel or heart of the wheat will be observed in the centre of the grain; this is a hard substance, almost transparent, is capable of being speedily reduced into a very fine flour, ferments readily with yeast, and is considered as the substance that produces the finest part of the flour.

15. In order to comprehend in what manner this useful grain is reduced to flour, it will be necessary to give a description of the complicated structure of a water mill, where the art is carried to the greatest possible perfection; but as it would answer no useful purpose to describe minutely the different wheels and their appendages, I shall pass hastily on, by observing, that over a running stream a building, consisting of three stories, is erected, the lower apartment being furnished with a large water wheel, which, communicating with a variety of other wheels, in different parts of the mill, keeps them in perpetual motion, and performs every branch of the business, to the entire exclusion of manual labour.

16. On the first floor, two stones of a circular form

form are erected, each of which have furrows cut in them, and these furrows, meeting like a pair of scissars, cut the grain, and cause it to grind more readily than could be done if they were quite plain. The upper stone turns round by means of an axis of iron in its centre; the lower one is somewhat thicker than the upper, and remains fixed and immoveable: this last has a gutter cut in it to give passage to the meal, and behind is a moveable screw which sets the stones at a greater or lesser distance from one another, according to the kind of grain that is required to be ground. On one side of the machinery stands a kind of funnel, called the hopper; its lower extremity is fixed to a spout that communicates with a hole in the middle of the upper stone, and underneath is placed a large trough for the reception of the meal.

17. On the second floor is erected a large binn, divided into two partitions, over which is affixed a patent machine, consisting of an eight-sided cylinder, about five feet long and one in diameter, open at both ends, the upper part of which is covered with an exceeding fine sheet of wove wire, and the lower half is also covered with wove wire, but coarser than the other. Within side are twelve narrow brushes, of the same length as the machine, whose points, by a separate motion, are brought into continual contact with the internal surface of the cylinder, to prevent the meal from adhering. This machine passes obliquely downwards, and is fixed to a trough which communicates with three loose shafts, called the joggling screens, lined at the

bottom with wove wire of different finenesses, and placed one above the other, each terminating in a separate locker.

18. On another part of the same floor stands, within a large binn, a bolting machine of a cylindrical form, covered with a patent cloth, so constructed as to be without a seam, open like the other at both ends, but has no brushes within it; this terminates in a bag for the reception of the meal.

19. The third story answers the purpose of a loft, where the meal is deposited in sacks till the miller is ready to dress it: there is likewise on one side of this apartment a very large binn, in the centre of which is a circular opening, terminating in a long hopper, which passes obliquely down into the second floor, and enters the upper part of the machine. On the other side of the same story there is a similar contrivance, which is also adapted to and communicates with, the upper part of the bolting cloth. Such, in a few words, are the outlines of those majestic engines which the ingenuity of man has invented for the purpose of grinding and separating wheat into flour.

20. When the mill is set to work, the wheat passes down the shaft, from a binn in the upper floor, into the hopper, and passing along the spout, by little and little, enters the eye of the upper stone or runner, which moves in a circular direction upon the lower, by means of the spindle; and when the grain is sufficiently ground, it is thrown out, in the form of meal, at a spout in the lower stone, and delivers itself into the meal trough

trough, where it remains till a sufficient quantity is ready for bolting.

21. It is then emptied into sacks, which are drawn up by a rope and pulleys into the upper chamber through trap doors, which, to prevent accidents, replace themselves as soon as a sack has passed. The meal is then emptied into the binn which communicates with the machine, and, passing gradually down the hopper, enters the cylinder, which, moving with the utmost rapidity in a circular direction, receives it, and separates through the upper part the fine or household* flour, which drops into the locker below, while the lower part lets a fine crisp substance, called the sharps, drop through. The remainder then passes out at the other end, and runs down the receiver into the upper joggling screen, which keeps moving up and down, and separates the bran, which runs down into a locker below. The finer portion, that drops through, passes into the second screen, which in the same way separates the twenty-penny, and what passes down the third screen is called rough stuff, and is usually made into pollard.

22. The sharps†, from a variety of grindings, are

* When the finest English wheat that can be procured is ground without admixture of foreign, this first separation of the meal is called superfine flower, and is sold to the pastry-cooks and others, under the denomination of Hertfordshire whites.

† Were the sharps, in the first instance, to be ground so fine as to be able to pass through the machine, and be separated into fine flour, the life of the flour, as the millers term it, would be destroyed, and the bread produced from it be uniformly heavy.

are kept together, and when collected in sufficient quantity, are reground*, the stones being set nearer to one another for that purpose. The meal is then drawn up as before, and emptied into the binn which communicates with the bolting mill; it then passes gradually along the hopper into the cloth (No. 17), which moves upon its own axis in a circular direction, and separates into the locker below the second flour. What passes out at the other end is caught in a bag, drawn up and separated as before through a coarser cloth (No. 15), which forms the fine middlings; the same process again takes place, and the remainder is dressed through a still coarser cloth (No. 11), and this is denominated coarse middlings; and what does not pass through this last cloth is mixed along with the rough stuff, to make that composition which the corn chandlers term pollard.

23. Such is the general course of the mealing trade, when the miller manufactures his own grain for the supply of the baker, and the usual produce of a quarter of wheat is as follows:

Of fine flour.....5 bushels, 3 pecks.
Of seconds.....half a bushel.
Of fine middlings.....1 peck.
Of coarse middling...half a peck.
Of bran.....3 bushels or half a sack.
Of twenty-penny.....ditto.
Of pollard.....2 bushels.

24. When

* The whole produce of these sharps is not always reground, as considerable quantities are sold to the biscuit bakers for the service of the navy, as it produces a lighter and better kind of biscuit, that keeps much longer than when it is made from flour alone.

24. When the flour is taken from the binns, it is put into sacks and weighed; each sack contains five bushels, and weighs two hundred and eighty pounds; it is then tied up and deposited in the store room, for some little time before it is delivered to the baker, because fresh ground flour, from the heat it receives in the mill, always occasions the bread to be heavy; at the same time care should be taken that it does not remain too long in the sacks before it is used, because a race of insects, who eat it unmercifully, is apt to be generated, and which increase so fast that in a very short space of time they will wholly destroy it. The finest flour is most liable to breed them, especially when stale or ill prepared; in this case, if it be examined in a good light, it will be perceived to be in a continual state of motion; and, on a nearer inspection, there will be found in it a great number of little animals of the colour of flour and very nimble.

25. If a little of this flour be laid on the plate of a double microscope*, the insects may be very distinctly seen in great numbers, very brisk and lively, continually crawling over one anothers backs, and playing a thousand antic tricks, whether for diversion or in search of food is not easily to be determined. These animals are of an oblong slender form, their heads are furnished with a kind of trunk or hollow tube, by means of which they take in their food, and their body is composed of several rings.

26. They do vast mischief among the magazines of flour laid up for armies and other public uses;

* Hall's Cyclopedia, Vol. i. Article Corn.

uses; and when they have once taken possession of a parcel of this valuable commodity, it is impossible to drive them out; and they increase so fast that the only method of preventing its total loss, is to make it up into bread. The way to prevent their breeding in the flour is to preserve it from damp, as nothing gets more injury by being put up damp than flour, and yet nothing is so often put up so. The miller ought always to be careful that the sacks are well dried and ventilated, and if they are afterwards kept in a room tolerably warm and dry, they will be preserved any reasonable time.

27. Before I conclude this part of the subject, I shall beg leave to state a circumstance that ought to be generally known by army contractors, mealmen, bakers, and others, who are sometimes obliged to heap up in confined places a great quantity of flour; as sometimes, from a combination of moisture and heat, a considerable quantity of hydrogene gas, or inflammable air, is generated, and as the process of baking is not unfrequently carried on by candle light, it is necessary, when the flour is emptied out of the sacks, to remove the light to some distance, as dreadful explosions are liable to take place by this gas coming in contact with the light. Though accidents of this kind are extremely rare, yet it is highly important their causes should be investigated and thoroughly understood, as it may not only tend to prevent the unhappy accidents that result from them, but it may also hinder the suspicion and prosecution of innocent persons on account of events which

which are produced merely by natural causes. I believe there are no instances on record where a spontaneous explosion took place in a flour warehouse in this country; but the following accidents occurred some years ago in Sardinia, and are related* by Count Morozzo, in the Memoirs of the Academy of Sciences of Turin.

28. On the 14th of December, 1785, about six o'clock in the evening, there took place in the house of M. Giacomelli, baker, in the city of Turin, an explosion that burst out the windows and window frames of his front shop, and the report was so loud as to be heard at a considerable distance. At the moment of the explosion a very bright flame, which lasted only a few seconds, was seen in the shop, and it was immediately observed that the inflammation proceeded from the flour warehouse which was situated over the back shop, and contained near three hundred sacks of flour. In this place a boy was employed in emptying out some flour by the light of a lamp. He had his face and arms terribly scorched by the explosion, his hair was burnt, and it was more than a fortnight before his burns were healed. He was not the only victim of this event, for another boy, who happened to be on a scaffold in a little room on the other side of the warehouse, seeing the flame, and thinking the house was on fire, jumped down and broke his leg.

29. In order to ascertain in what manner this accident

* For a translation of this account, see the second volume of the Repertory of Arts and Manufactures, p. 416.

accident took place, the Count examined the warehouse and shop very narrowly, and, from the information he could collect, it appeared, that the boy was letting some flour down through a trap door from the warehouse into the bake-house, when a sudden fall of a great quantity took place, followed by a thick cloud, which immediately caught fire from the lamp hanging to the wall, and caused the explosion. Suspecting that this flour might have been laid up in a damp state, he inquired into that circumstance, and found, upon examination, that it was perfectly dry; there was no appearance of fermentation in it, neither had there been any sensible heat. This phœnomenon was not entirely new to the baker, who told Count Morozzo, that he had witnessed a similar inflammation before; it took place in a flour warehouse, where they were pouring flour through a long wooden hopper into a bolter, while there was a light on one side; but in this case the inflammation was not followed by an explosion. He also mentioned several other instances; among others an inflammation of the like kind that happened at the house of Joseph Lambert, a baker, in the same city; and this was merely occasioned by shaking some large sacks which had been filled with flour near a lighted lamp, but the flame, though pretty brisk, did not do any mischief.

30. From the foregoing account it appears, that, as the flour fell down, a quantity of inflammable air, which had been confined in its interstices, was set at liberty, and this rising up, was inflamed

flamed by the contact of the light, and mixing immediately with a sufficient quantity of atmospheric air, caused the explosion. These interesting facts shew that spontaneous inflammation is liable to take place in warehouses where certain kinds of dry goods are deposited, and, therefore, that too much attention and vigilance cannot be employed to prevent the dreadful effects that might ensue; and consequently it is impossible to be too careful in watching over public magazines and storehouses, in order to examine particularly if they have any moisture or heat in them; and these examinations should always be made by day, it not being adviseable to carry a light into the magazines, for when the fermentation is sufficiently advanced, the vapours which are disengaged by it are in an inflammable state, and the approach of a light might, by their means, set fire to the substances whence they proceed. Ignorance of these circumstances, and a culpable negligence of those precautions which ought to be taken, have caused more misfortune and loss than the most contriving malice could suggest or execute. The memorable loss of the Russian frigate, that was burnt in Cronstadt harbour, is a striking instance of this observation.

31. In America the improvements of the mother country are adopted with spirit, and the principal part of their flour is now ground by water mills; and they are the more readily induced to encourage them as labour is very expensive, and whatever can be done by machinery and few hands is very properly had recourse to. The

The corn mills at Middletown* in the province of Pensylvania are a fair but flattering specimen of the American improvements. The bolting mill is a six-sided cylinder, about twelve feet in length and one foot in diameter, covered at about every two feet with white silk† of various finenesses. It is inclined in an angle of 45 or 50 degrees, and turned round by a movement connected with the water wheel. It separates the flour into superfine, tail flour, middlings, sheep stuff, shorts, and bran; sometimes the tail stuff and middlings are dressed over again, and in some cases a bolting machine is appropriated to the middlings. In the year 1796 the prices of the several articles at these mills were as follow:

	s.	*d.*
Superfine flour per sack	37	6
Tail flour ..... do.	30	0
Middlings ..... do.	22	6
Sheep stuff ..... do.	4	6
Shorts ..... do.	2	1½
Bran ..... do.	0	4½

32. A load of wheat of sixty bushels, at that time, was about twelve guineas; this cost fifteen shillings grinding; the waste in grinding is about twelve pounds per hundred weight, and sixty bushels will make twelve barrels of flour of 196 pounds each, *i. e.* somewhat more than three bushels to a hundred weight. The offal pays the expense

* Cooper's Information respecting America, p. 133.

† The brass wire bolting machines are not yet introduced into America.

pense of grinding and barrels. The flour is then sent to the Philadelphia market, and costs for carriage, at six shillings per barrel, about three pounds twelve shillings. It there fetches about thirty shillings a barrel, or eighteen pounds for the load.

33. In the East Indies* flour is ground by hand, with stones of about eighteen inches in diameter; the wheat (which is by no means so good a grain as that in England, either as to size or quality, and containing a much larger proportion of bran) is previously soaked in water. The pressure and force of these stones is sufficient to grind both the bran and all the outer part of the grain which constitutes the coarse flour, but the kernel of the wheat is not reduced to flour, but appears among the meal like fine sand. The whole is then sifted, the flour passes through, and the bran, pollard and the kernel remain behind. Women are then employed to separate the kernel, which they do, with great address, by means of small winnowing fans. It is then used by the superior classes for baking of fine bread, and the flour is sold to the common people to make cakes with.

34. Captain Cochrane made an experiment, while in India, to ascertain the proportion of the different articles the Bengal wheat were usually separated into, and from the result it appears, that, in four thousand one hundred pounds weight of wheat, there was of

The

* Cochrane's Seaman's Guide, p. 12.

	lb.
The kernel	1348
Of the flour	1680
Of the pollard	118
Of the bran	888
And loss in grinding	66
	4100

35. For the accommodation of private families, a most ingenious flour mill and bolting machine has been invented by Mr. Rustall, a wheelwright at Purbrook Heath, near Portsmouth, which may be constructed at a moderate* expense, and requires but a small space of ground to stand on; it may be worked within a room in a farm house, or even in a kitchen, without occasioning much incumbrance. Its peculiar excellence consists in this circumstance, that, from the vertical position of the stones, action may be given to it without the intervention of cogs or wheels. It may be used to grind malt, to bruise oats for horses, or to make flour, or for all these purposes; and it can easily be altered to grind fine or coarse as occasion may require. It may be worked by a man and a boy, who may grind and sift in about an hour a bushel of wheat; and the housekeeper, if he grows or purchases his own grain, will then have

* The Society for the Encouragement of Arts, Manufactures, and Commerce, conceiving this invention to be of the utmost consequence to society, not only voted Mr. Rustall a premium of forty guineas, but caused a particular description of it to be published in their transactions.

have the satisfaction of knowing that his flour is free from adulteration, and he may be assured that the life of the flour is as well preserved as if it had been ground in a water mill.

36. The mill consists of two stones, about thirty inches in diameter and five inches thick, placed upright, one being moveable and the other fixed; on the upper part is placed a hopper, on the lower a receiver for the meal, and on one side a fly wheel; the whole being inclosed in a frame work, and a cloth hood is placed over the stones to prevent the fine particles of flour from falling off. The runner is turned round by a handle annexed to its axis, and the wheat passing down the hopper is delivered into the mill through a spout that passes into the centre of the bed stone; and when it is ground into meal it falls into the receiver underneath. It is then taken out and put into a kind of chest called the bolter, in which is placed a fine sieve, which, by a peculiar motion, separates into different partitions the fine flour from the bran, with little labour or trouble.

CHAP.

CHAP. III.

ON THE ANALYSIS OF WHEAT FLOUR.

SECT. I.

IT is not my intention to enter into any elaborate chemical investigation respecting the nature of wheat, but merely to confine my inquiries to such points as may prove of real and essential service in the manipulatation of bread.

2. In order to accomplish this useful purpose, it was necessary to decompose a portion of wheat flour into its elementary parts, or constituent principles, without altering or destroying their nature, an operation known in chemistry by the name of analysis*.

3. These elementary particles were again recombined into a body absolutely similar, both in appearance and effect, to what it was before analysation; a decisive evidence that this synthetic process was rendered compleat, and modern chemistry teaches us never to rest satisfied without both these species of proof.

I took

* I thought it necessary to repeat the experiments of Beccari and others, and detail them fully, in order that the subject might be readily and distinctly understood, by persons unacquainted with chemistry and chemical authors. And with respect to the observations from other works, although not noted by inverted commas, they are referred to at the bottom of the page.

4. I took one pound of the seed* of wheat, that grew on a well cultivated soil, and ground it in a hand mill; the meal was then sifted through a fine lawn sieve, and when the whole was separated there remained three ounces of bran and twelve ounces of fine flour; this last was put into a hair sieve, and a stream of water was gradually poured over it, while I kneaded it into a paste; I went on kneading and adding more water from time to time till the following appearances took place.

1st. A glutinous substance remained in the hand, which was very elastic, of a greyish white colour, and when drawn out to its fullest extent had the appearance of animal membrane; in this state it adhered strongly to dry bodies, and formed a very tenacious glue†, which was formerly in use for mending broken china.

2dly. A fæcula of delicate whiteness subsided to the bottom of the vessel; it was soft to the touch, very fine in taste, scarcely sensible, and is known in commerce by the name of starch.

3dly. A clear liquor remained in which the foregoing articles had been suspended; it was of a brown colour and sweetish taste; this was decanted off for future examination. These articles were the sources of several experiments; I propose

* It was necessary to take the seed wheat and grind it at home, because the examination from millers' flour can by no means be accurate, as the bran and pollard are taken out as well as the sharps from which the seconds flour and middlings are separated.

† Fourcroy's Chemistry, vol. 4, p. 100.

I propose therefore to treat of them under the three following heads.

FIRST.

OF THE GLUTINOUS SUBSTANCE.

5. The glutinous substance that remained after kneading, was dried gradually before a gentle fire, and in proportion as the moisture evaporated it lost its elasticity, till at last it was perfectly brittle, nearly transparent, resembling glue, or isinglass, and weighed six drachms.

6. A cake of this dried glue, on being placed over a piece of burning charcoal, first swelled, and then emitted a strong fœtid smell, like burning horn or feathers. If odour may be considered as a test of animal matter this most undoubtedly exhibited it.

7. Another portion was exposed to a moist air for about ten days, the thermometer during this period varying from 60 to 75 degrees; it gradually lost its tenacity, threw up bubbles of air, and putrefied in the same manner as animal matter; but it did not, like vegetables, exhibit, during the intermediate period, any appearance either of the vinous or the acetous fermentations.

8. I received some of the vapour emitted from the putrefying gluten into a receiver in the pneumato chemical apparatus, and introduced along with it a small measure of azotic gas, when the union produced a volatile alkali; which demonstrates that this glutinous substance, however it may originate, is certainly and

and to all appearance does resemble animal matter in its products.

9. A cake of the glutinous substance was reduced to a powder, and mixed up with water and yeast, and placed in the temperature of 70 degrees of Farenheit's thermometer for six hours, in order to ascertain if it had any share in producing fermentation; but so far from fermenting, it ran into the same kind of elastic matter that it was before exsiccation.

10. From what has been said, it is evident that this substance is totally different from vegetable matter, but rather resembling animal; had it been vegetable, it would have run into the vinous or acetous fermentation before it became putrid; but instead of so doing, it became immediately putrid without any intervening change, just as a piece of mutton or beef would have done had they been so exposed.

11. It is to this gluten that the wheat owes the property of forming a very adhesive paste with water, and the facility with which it rises in leaven; but what share it has in producing that process will be considered hereafter.

12. This gluten does not exist in barley, or at least in a very small quantity, the flour of which makes a very solid opaque paste, scarcely ductile, easily broken, and which does not readily ferment when exposed to the same temperature by which that process is effected in wheat paste.

13. The glutinous part of wheat was observed long ago, but the cause of it was not perceived, whilst it seemed to possess only the qualities in common

common with the other farinaceous grains; but it was about the year 1728 that M. Beccari* of Bologna discovered something in the constitution of wheat very different from what he could perceive in any other farinaceous grain; this discovery has since been confirmed, in every respect, by many philosophers and chemists in different parts of Europe. Dr. Cullen was of opinion, that it is this part of wheat, taken entirely by itself, which renders it more fit for spontaneous fermentation than any other farinaceous substance; and he observes, that if a portion of this glutinous part of wheat is added to barley flour, that it can be brought into a more perfect bread than it could be without such addition. The same effect will take place if a portion of this gluten is added to potatoes and yeast, which then ferments and makes a tolerable good bread; but without this substance or wheat flour is added, bread cannot be prepared from potatoes.

14. M. Parmentier however asserts, that potatoes alone will make good bread without any other addition; he says, that if equal quantities of potatoe starch and potatoes, boiled to a pulp, are mixed up with some yeast and warm water, and left well covered up in a kneading trough all night, that fermentation will take place; and that, if it is kneaded up with pure starch and boiled potatoes, it will, when baked, turn out good bread. I must confess, with all due deference to M. Parmentier's opinion, that I have

* Cullen's Mat. Med. 8vo. edit. vol. 1, p. 233.

have not been able to prepare such bread; and Dr. Pierson, who has instituted several experiments to ascertain the nature of this root, is decidedly of opinion, that without being mixed with wheat flour, it cannot be fermented so as to make a bread; indeed it is clear, that no farinaceous substance can be made into a good light bread that is destitute of the three constituent parts of wheat.

15. For if starch is separated from potatoes, and the glutinous substance of wheat added, with yeast and water, a bread cannot be formed, because the saccharine extract on which the process of fermentation depends, is wanting; but if a portion of it is added, even in its concentrated state, to the other articles, then fermentation will presently take place.

16. With respect to the proportion of the glutinous substance contained in flour of the best quality, that, I believe, is not yet accurately ascertained. In three experiments that I made, with different kinds of flour, one contained an ounce of this substance in a pound, another an ounce and a half, and the third only six drachms. M. Beccari found from a third to a fifth; and Dr. Nisbett, but upon whose authority he does not state, says one-fourth: but this difference in the results may vary in different seasons*, and probably also from difference in culture. Indeed, I have some reason to suspect that wheat growing on land well manured contains

* Winter, in his Dissertation, p. 103, observes, that in rainy years the gluten is smaller in quantity than in dry seasons.

tains more of this gluten than that produced from a neglected soil.

17. This is an interesting subject, and the knowledge of it may prove essentially useful to bakers who purchase their own wheat, and send it to a mill to be ground; for, in order to ascertain whether it has been adulterated* with any other grain, they may first grind a pound of their own wheat into flour, and mix it up with water into a paste; then knead it with repeated quantities of water, until all the farinaceous parts are washed away, and nothing but the glutinous substance remains. This should be dried and powdered, and then the same experiment ought to be repeated with a pound of the flour that comes from the mill; and when the gluten from each is equally dry, they must be weighed, and if they are not both of the same weight, it is evident that either the flour has been adulterated with some other grain, or that the wheat has been changed for some of inferior quality.

SECONDLY.

OF THE STARCH OF WHEAT.

18. The fæcula deposited at the bottom of the vessel was dried before a gentle fire; and, on weighing it afterwards, was found to amount to ten ounces. This powder was pure starch of a delicate white colour, and as it forms the most

* Cochrane's Seaman's Guide, p. 19.

most considerable part of the grain, it cannot be doubted but that it is the principal elementary substance contained in bread; and what gives stability to this opinion is, the well-known fact that thousands of human beings are supported in Ireland, the principal part of the year, upon potatoes alone, which contains this substance in considerable quantity, and is destitute of the gluten that has been so much insisted upon as being so extremely nutritive. Besides, from some experiments that have been made, it appears that feeding animals upon the gluten or animal part of wheat, and others upon the meal freed from the matter, that the former is much less nutritive than the latter. But waving that question, it is well known that the mealy part of flour is incapable of being fermented into bread, because it wants the mucilaginous gluten to give it tenacity, and the saccharine matter to induce fermentation, as the following experiment will evince.

EXPERIMENT.

19. I took four ounces of the powdered starch, and put it into a wooden bowl; a sufficient quantity of water, at the temperature of 70° of Farenheit's thermometer, was added, and one tea-spoonful of yeast. This mixture was kneaded up with the powdered starch, and set by the side of a fire, the thermometer standing at 76°. In this situation it remained two hours without rising: it was then baked, but with no better success.

EXPERIMENT.

EXPERIMENT.

20. To a small quantity of the starch in powder, I added some of the glutinous substance in powder, with some water and yeast, and placed the mass in proper circumstances to become bread, but it never rose; and when baked, the cake was just the same as if it had been made from flour and water alone.

21. I therefore repeat, that although the starch is that part of wheat from whence its nourishing properties are principally derived, yet, when separated from the other constituent parts, is incapable of being made up into bread, and therefore in that state is unfit for the common purposes of mankind.

THIRDLY,

OF THE SUGAR OF WHEAT;

OR, THE SACCHARINE EXTRACT.

22. I NOW took the coloured water, which measured six pints, and evaporated it over a slow fire, till reduced to a kind of extract, called, by M. Poulletier, the Mucoso Saccharine Matter. This fluid, while evaporating, was occasionally

occasionally filtered, to remove any selinite that might be contained in the water. When the process was finished, it weighed two drachms, was of a dark brown colour, and disagreeable smell, neither salt nor sweet, yet impressing the tongue with a mixture of both.

23. This extractive matter was afterwards dissolved in alkohol; and, on examining it some time afterwards, I observed that a precipitation had taken place. The syrupy liquor was then poured clear off into a glass vessel, and a few grains of alum and quick-lime were added, and again filtered; it was then evaporated to the consistence of honey, that the spirit might fly off. I now diluted it with water, and added a little white of egg: this occasioned a coagulation to take place, and the liquor was again filtered and evaporated to a thick syrup; and on cooling, it crystalized and formed tetrahedral prisms, with dihedral summits like sugar-candy, and proved perfectly sweet to the taste. This may, therefore, be considered as a pure vegetable oxyde, consisting of carbon, hydrogen and oxygen, and is undoubtedly that part of wheat in which the fermenting principle resides, as the following experiment will evince.

EXPERIMENT.

24. I took two drachms of the crystals prepared from the saccharine extract, and dissolved it in one ounce of distilled water at the temperature of 70° of Farenheit's thermometer, to

which I added half a tea-spoonful of yeast, and set the mixture in a place where the heat was 76°. In about three hours it began to ferment, the globules of air being extricated very copiously; and, after remaining in this state for twelve hours, it was poured into a glass retort, and a few drops of a weak limpid spirit were distilled over, which coagulated, on adding a little white of egg.

25. This experiment clearly proves, that however small the quantity of sugar may be that is contained in wheat flour, yet, that its presence is absolutely necessary to make good bread; and that, if by any process this was to be separated from the flour, it would be impossible to produce fermentation, and consequently the bread would be compact, heavy, and very hard of digestion.

26. In recapitulating the result of these experiments, it appears, that in a pound of seed wheat there is contained,

	oz.	*dr.*
Of bran	3	0
Of starch	10	0
Of the glutinous substance	0	6
Of the sugar	0	2
And the loss in grinding and reducing the flour to starch . . .	2	0
	16	0

OF

OF THE SYNTHESIS OF WHEAT FLOUR.

27. I have detailed in the preceding sections such experiments as appeared necessary for ascertaining the constituent parts of wheat flour; and demonstrated what share each has in the production of bread. But there is another trial demanded in prosecuting chemical enquiries, viz. the formation of a compound by the artificial reunion of the several principles, which should be similar in its effects to the body decomposed. The utility, extent, and dependance that may be placed upon the result it affords, renders this last proceeding by much the most valuable method, as a true analysis cannot be made without the help of this recombination.

28. Having premised thus much, it will be barely necessary to state the result of the following experiment, in order to prove, that when the component parts of flour are again reunited, that it is as susceptible of fermentation, and as readily made up into bread, as it was before decomposition. That the saccharine matter is the cause of this fermentation is evident from the experiment, where the gluten and starch were mixed up with water and yeast without fermenting, yet now, when the sugar is added, it takes place as readily as if flour was used.

EXPERIMENT.

EXPERIMENT.

29. I took five ounces of the starch, three drachms of the glutinous substance, and one drachm of the sugar of wheat. To these, after having been rubbed into a very fine powder, was added, a sufficient quantity of warm water, and one tea-spoonful of yeast. This mixture was placed in proper circumstances for producing bread; in due time it rose properly, was baked, and turned out a very light, good, and well-tasted bread, indeed, just the same as if common flour had been used.

30. It was stated, in treating of the glutinous substance, that its appearance and products resembled animal matter; I therefore, in order to ascertain if isinglass, sugar, and starch, would produce a bread similar to wheaten flour, prepared the following

EXPERIMENT.

31. I took four ounces of fine starch, half an ounce of isinglass, two drachms of sugar, a tea-spoonful of yeast, and kneaded them up with warm water into a paste, and set it before the fire for some time to prove; in the course of half an hour it rose as bread usually does, and when baked, was light and porous, but more resembled muffin than bread, and appeared to want nothing but a little salt to render it palatable.

32. This

32. This experiment I consider as a very satisfactory one, as it demonstrates most clearly the constituent principles of wheat, and points out to the enquiring mind a mode by which the manufacture of different kinds of bread may be improved; for any person, by knowing that starch, isinglass, and sugar, ought to enter into the composition of good bread, will be able to prepare such, by adding either of these substances, that may be wanting, to the article they make their bread of. Thus, if potatoe bread is wanted, we enquire into its composition, and find that it is a combination of sugar and starch; therefore, by adding isinglass to it, it will ferment and become bread, but isinglass being too expensive an article for such purposes, we add a portion of wheat flour, which contains the gluten we want, and thus a good bread is formed.

33. Upon this interesting theme many observations might be advanced, but as it would break into the thread of the subject I have proposed to investigate, we shall therefore proceed with the analysis of yeast.

CHAP. IV.

ON THE ANALYSIS OF YEAST.

SECT. I.

IT now remains to inquire what the agent is that produces fermentation in farinaceous substances. The one in common use is yeast, and the order of my inquiry naturally leads me to examine what share this substance has in that singular phænomenon. For this purpose it will be necessary to repeat in detail the following experiments, and from the conclusions that obviously arise, I trust a satisfactory explanation will be given why yeast is useful in promoting fermentation.

EXPERIMENT.

2. I procured some yeast, fresh from the brew-house, and put a small quantity in an open vessel, and evaporated it to dryness in a sand bath. It was afterwards moistened with water at the temperature of 70°, and made up into a paste with some flour: this was set in the usual way to prove; but notwithstanding it was placed in proper circumstances for the production of bread for six hours, yet it never rose, and

and on examining the mass afterwards, it appeared as dense as a piece of unleavened bread.

EXPERIMENT.

3. I now took half a pint of yeast, and put it into a glass retort, to which was adapted a receiver, and distilled over, by means of the heat of a lamp, about two ounces of a limpid liquor resembling water, and of an empyreumatic taste.

4. This liquor was afterwards boiled in an open vessel, to disperse any gas that might be impregnated with it; and when cooled to 70°, it was mixed up with flour and water into a paste, and set before the fire in order to prove; but this, like the preceding, never rose, although it was also suffered to stand several hours.

EXPERIMENT.

5. I took a pint of yeast, and put it into a glass retort: this was placed over the pneumato-chemical apparatus, and by means of a lamp several vials of a gas were received over, and subjected to the following tests.

1st. I took one of the vials, and introduced into it a lighted taper; this, in an instant, began to burn dull, and before it had reached the bottom was extinguished.

2dly. A mouse was introduced into another of the vials, care being taken that no atmospheric

air should gain admittance. In a very short time it began to pant for breath, and ran about in great uneasiness: it soon after became convulsed, and in the space of ten minutes expired.

3dly. A small quantity of lime water was poured into another of the vials; this presently became turbid, and on suffering it to rest, the lime was deposited, and the water became tasteless.

4thly. A paper dipped in the tincture of turnsol was introduced into one of the vials: this was soon observed to change colour, and become of a bright red.

5thly. I took a quart bottle full of distilled water, and expelled, by means of this gas, the greatest part of it; it was then corked under water, and left with its mouth inverted for a night. The next day, the water being highly saturated, sparkled and tasted like Seltzer water; it was then suddenly emptied into a quantity of dough that had been previously blended with some warm water, and kneaded well together. This mass, on standing about half an hour, rose as leaven usually does, and when baked, was as light and porous as bread prepared with yeast.

6. From these circumstances it must evidently appear, that the virtue of the yeast resides in a gas, and this gas is clearly the carbonic acid gas, or the fixed air of Dr. Black; and, of course, is that part of yeast which induces fermentation. The residium at the bottom of the retort, however, was very carefully examined, but it appeared perfectly inert, and was incapable of inducing fermentation.

7. I take

7. I take it for granted that the carbonic acid gas is that part of yeast which excites fermentation, and the saccharine extract of wheat the body that is acted upon; but before the theory of that curious process is considered, it will be necessary to ascertain if the carbonic acid gas, artificially prepared, will produce fermentation in flour so as to make bread.

EXPERIMENT.

8. I took a quantity of powdered marble, and put it into a glass retort, to which was added some sulphuric acid diluted with water. The gas, which was immediately extricated, was received over the pneumato-chemical apparatus into a quart bottle previously filled with water; when the greater part of it was expelled, it was corked under water, and agitated for half an hour. The liquor was then emptied into some warm dough, and quickly kneaded up; it was then covered up and set before the fire; in the course of an hour it rose as bread should do, and when baked, was light, porous, and in every respect resembled good bread.

EXPERIMENT.

9. I took a gallon bottle, during the time some beer, which had just been tunned, was fermenting, and after filling it with the same liquor, set it over the bung hole, which I took care to render air tight. The gas presently drove out

the beer, and took its place. A small quantity of flour and water was now mixed together, and poured into the bottle, and, after considerable agitation, it was emptied into some warm dough, and placed in a wooden trough before the fire. This presently rose, and when baked, exactly resembled bread made with yeast.

10. Thus I have shewn what are the principles which enter into the composition of bread, viz. gluten, starch, sugar, and fixed air, to which may be added water and heat. I shall now endeavour to ascertain their mode of action, or, in other words, explain how fermentation in bread is produced.

CHAP.

CHAP. V.

ON THE THEORY OF FERMENTATION IN BREAD.

SECT. I.

FERMENTATION is an intestine motion excited spontaneously *, with the assistance of proper heat and fluidity betwixt the integral and constituent principles of certain compound bodies, from which result a new combination, different both in property and proportion to what it was before fermentation.

2. It will be necessary, in order to elucidate this intricate subject, to consider the preparation of bread under three distinct heads. First, that kind where the flour is neither brought into the saccharine state, nor undergoes the vinous fermentation, but passes directly into the acetous stage. This is a tedious process, and its product is called leavened bread. Secondly, where to flour and water yeast is employed, the vinous fermentation is excited; this continues but a very short period, and the dough must not be allowed to remain unbaked after it is complete, otherwise it will pass rapidly into the acetous stage: this may be called carbonic bread.

* Macqueer's Chemical Dictionary, p. 266.

bread. And lastly, when flour and water are kneaded together and baked, without undergoing any fermentation at all, unleavened bread is produced.

3. Under the two first heads I purpose to make a few observations, as some little difference of opinion has arisen concerning them, between medical men, who seem to have confounded * both fermentations under one. With respect to the last, as no fermentation is excited, any remarks in this place will be perfectly unnecessary.

4. Bread made with yeast is an operation soon performed. The flour, in this case, being seldom mixed up oftener than twice, that is to say, the yeast is added to a part of the flour, and well kneaded; this, in a short time, swells and rises in the trough, and is called setting the sponge. The remainder of the flour is afterwards added, and with a sufficient quantity of water to make it into dough, and then allowed to ferment and rise.

5. The water, which is mixed with the yeast, being warm, extricates † the air in an elastic state, and as it is now by kneading, diffused through every part of the dough, every particle must be raised, and the viscidity of the mass retains it, when it is again well kneaded and made up into loaves.

6. It is now baked, and a still greater quantity

* See Fourcroy's Chemistry, Vol. IV. p. 106, and Dr. Higgins's Experiments and Observations, p. 347.

† Dr. Pennington's Inaugural Dissertation, p. 10.

tity of the air is extricated by the increased heat; and as the crust forms, the air is prevented from escaping, the water is dissipated, the loaf is rendered somewhat dry and solid, and between every particle of bread there is a particle of air, as appears from the spongy appearance of the bread.

7. So much for the mechanical part of this operation. We are now to consider in what way the constituent principles of yeast and flour unite, so as to occasion fermentation; and this circumstance deserves minute attention, for on establishing a well-grounded theory on this subject depends the whole art of baking bread.

8. From an attentive consideration of the foregoing experiments and reflections, it appears clearly to me that the saccharine extract of the wheat flour, in consequence of moisture, has its constituent principles disengaged, the oxygen seizing the carbonaceous matter, and forming carbonic acid, which is disengaged in the form of gas, and occasions that intestine motion and increase we have just described; but the process, if left to itself, is extremely slow, hence its progress is accelerated by the addition of yeast, which is powerfully impregnated with this principle.

9. But in order that the operation shall succeed, it is necessary that the leaven shall swell and rise; this is partly effected by means of heat, which rarifies * the air, and causes it to occupy a larger space than it did before.

10. While

* The action of heat, in separating the particles of air from

10. While the carbon and sugar are in action, the glutinous substance, which becomes elastic by the addition of the warm water, forms a membrane among the dough, similar to the web of a spider, which gives room for the united particles to expand in; and this they cannot do when the gluten is not present, as was demonstrated in the experiment where the starch would not ferment when mixed with water and yeast only, but ran into an opaque mass. I am therefore of opinion, that this membrane, by widening and elongating the theatre of action, gives room for the fermenting principle to insinuate itself between every particle of the starch, which are thereby separated from one another. The mass, now requiring more room, swells and presents that reticulated appearance we observe in this singular process.

11. As soon as the dough begins to sink and fall a little, it is made into a loaf and put into the oven: the heat converts the water into an elastic vapour, and the loaf swells more and more, till at last it is perfectly porous. Any person, by repeating these experiments, may easily

from one another, is beautifully exemplified by holding a hot iron ladle over a Florence flask half full of water, inverted in a jar of the same fluid with its mouth downwards. The heat rarifies the air by setting the particles at a greater distance from one another, and the water is expelled; but on removing the ladle, the air again contracts into its former space, and the water rises up into the flask exactly to the same height as it occupied before the experiment.—*Dr. Pierson's Chemical Lectures.*

easily perceive that this is no hypothesis founded on conjecture, but the natural consequence of a successive chain of facts.

12. Now, in making bread from leaven, the same phenomena take place, but a longer space of time is required to accomplish the fermentation, and a different mode of mixing the dough must be here pursued. A small quantity of flour and water are mixed together, and allowed to remain several hours covered up. In this case, the water is decomposed, the oxygen of that fluid uniting with the saccharine extract of the flour, bring on a fermentation; but it is not of a vinous, but an acetous nature; fresh flour and water are added to this dough as soon as it is perfectly sour, and allowed to ferment and rise, when more flour and water must be added at stated intervals, till a sufficient quantity is ready for baking.

13. A great deal of nicety is required in conducting this operation, for if it is continued too long the bread will be sour, and if too short a time has been allowed for the dough to ferment and rise, it will certainly be heavy.

14. Other articles are in use for exciting a speedy fermentation in flour in different counties, but they may all be referred to the two above heads: either they are impregnated with the carbonic acid gas, or they contain a principle of acidity: hence we read of the excellent light bread that is made at Paris with the waters of Gonesse, without the addition of any yeast. The same is done at Pyrmont, with the Seltzer water, and the like may be made in England with

with the artificial Seltzer water prepared by Mr. Schweppe; and we are informed by Dr. Pennington, on the authority of Dr. Rush, that there are two mineral springs near Saratoga, in America, the waters of which, when mixed with flour into dough, are sufficient without yeast to make a light and palatable bread. Now all these waters are well known to be highly impregnated with fixed air, and whoever can concentrate this air in sufficient quantity to mix with flour, may make as light a bread as any baker with yeast, and in no respect will it shew a test of acidity.

15. On the other hand, the fermentation in leavened bread is manifestly different: here the principle of acidity is required; and we learn from the observations of travellers, that in most warm climates, where the inhabitants are not in the habit of brewing beer, they are under the necessity of raising a leaven with the acetous fermentation. Indeed, this may be known by barely tasting their bread, which is uniformly sour.

16. However, notwithstanding this assertion, it is possible to make good leavened bread, that to the taste exhibits no mark of acidity; and I am credibly informed, that most excellent bread is frequently baked on board of our ships of war that are on the West India station, with the water that has become sour in the casks, and that the fermentation is as speedily excited as when made with yeast.

17. In the East Indies, where fermentation is extremely

extremely quick *, bread is raised and baked by a liquor called toddy. This liquor is taken from the branches, or more properly, the fibres which produce the nut on the top of the tree. One, two, or three of these fibres are cut over towards the end, and a small calabash or vessel suspended, into which the end of the fibre is put, from which the liquor drops. As the liquor ceases to flow, a small piece is cut off the end of the fibre until it is necessary to begin a new one. The toddy men, as they are called, collect this liquor twice a day, early in the morning and in the evening. If drank immediately when collected it is rich and wholesome, and has no intoxicating quality; but if what is collected in the morning is kept only two hours after sun-rise, it ferments so quickly, that it is sufficient to intoxicate a man. In this state it is fit to bake with, in the same manner as yeast in this country, and is universally used in all the distilleries of India to promote fermentation.

18. In the West Indies there is a liquor called dunder † remaining at the bottom of the still after the process of distilling rum is complete, which liquor is peculiarly serviceable in exciting a speedy fermentation, as, from the great heat of the climate, it is a very difficult circumstance to prevent it from running more or less into the acetous change; and was not the process to be hurried on by the addition of this dunder,

* Cochrane's Seaman's Guide, p. 15.

† Edwards's History of the West Indies, abridged, Vol. ii. p. 504.

dunder, it would become perfectly sour before the fermentation was complete. Whether it is used for baking bread I am not acquainted, but there is no doubt but that it would answer equally well as yeast.

CHAP.

CHAP. VI.

ON THE PREPARATION OF BREAD.

SECT. I.

MAN, who appears to be designed by nature * to eat of all substances that are capable of nourishing him, and still more of the vegetable than the animal kind, has, from time immemorial, and in all parts of the earth, used farinaceous grains as the principal basis of his food; but as these grains cannot be eaten by him without difficulty in their natural state, this active and intelligent being has gradually found means not only to extract the farinaceous part, which is the only nutritive property they contain, but also to prepare it in such a manner as to render it a very agreeable and wholesome aliment: such is the bread we now generally use.

2. Nothing appears so easy at first sight as to grind corn, to make a paste with the flour and water, and bake this paste in an oven. Those who are accustomed to enjoy all the advantages of the finest human inventions, without reflecting on the labour it has cost to complete them, think all these operations common and trivial.

3. It

* Macqueer's Chemical Dictionary, p. 64.

3. It is however very certain, that for a long time men no otherwise prepared their corn than by boiling it in water, and forming viscous cakes, of neither an agreeable taste or easy digestion, before they were able to make good bread; for, to accomplish that, it was necessary to invent machines for grinding corn, and for separating the pure flour with little labour and trouble; and that inquiries, or rather accident, which some observing person availed himself of, should discover that wheat flour, mixed with a certain quantity of water and moderate heat, was susceptible of fermentation, which almost destroys its viscidity, heightens its taste, and renders it proper to make a light bread, agreeable to the palate, and of easy digestion.

4. It is observeable, that there are but few nations who do not use bread, or a substitute for it, as an article of their food. Thus the Laplanders*, having no corn of their own, make a kind of bread of their dried fishes and of the inner rind of the pine, which seems to be used not merely as a nutriment, but also for supplying a dry food, for which mankind seem to have an universal appetite, in preference to that of a bland, slippery, and mucilaginous nature.

5. This is not commonly accounted for, but it seems to depend upon very simple principles. The digestion of our food requires the mixture of the animal fluids in every stage; among others, the saliva is necessary, which requires dry food as a stimulus to bring it forth; bland, slippery,

* Cullen's Mat. Med. 8vo. edition, Vol. I. p. 231.

slippery, and fluid aliments, are too inert, and make too short a stay in the mouth to produce this effect, or to cause a sufficient degree of manducation to emulge that liquor, for which reason we commonly use dry bread along with our food, as nothing is so fit as bread, assisted by a previous manducation.

6. Bread is of like necessity in the stomach, as it is proper that a substance of a solid consistence should be long retained there. Now, as the animal fluids must be mixed with our aliments, liquids would not attain this end; whereas the solid stimulates the glands of the stomach, and causes a flow of the gastric juice. Bread thus appears to be proper, independent of the nourishment it affords, to attain this end, being bulky without too much solidity, and firm without difficulty of solution.

7. The period when bread was first introduced is very uncertain; it is probable, however, that it was made use of in the earliest ages of the world. The first obvious method of reducing corn to flour for bread would be by the simple expedient of pounding*, and that was for ages the only one practised by the various descendants of Adam. But even before this simple contrivance was effected, or men knew the use of corn, they made a bread of acorns, which, as mentioned by Virgil, were deprived of their covers by boiling, and then made into a paste by pressure. In this way their astringency being destroyed, they were dried in the sun or baked over

* Encyclop. Brit. Vol. I. p. 24.

over embers, and this kind of bread is made use of to this day in some countries.

8. There is reason to believe, from several passages in Homer and Herodotus, that the process of pounding corn was early improved by the application of a grinding power, and the introduction of mill-stones; these, like most of the common refinements in domestic life, were probably the invention of the antediluvian world, and were certainly practised in some of the earliest ages after it. Like most of them, they were equally known in the east and the west, and the Gauls and the Britons appeared familiarly acquainted with the use of hand-mills before their submission to the Romans, but it was not till more modern times that wind and water mills were invented.

9. In order to prepare bread, flour and water are kneaded together into a tough paste: this contains the principles of the flour, but very little altered *, and not easily digested by the stomach. The action of heat produces a considerable change, it renders the compound more easy to masticate as well as to digest. Bread made in this manner is called unleavened, and is used for shipping in considerable quantities. But most of the bread used in France, Germany, and other European countries, is made to undergo, previous to baking, a kind of ferment. The effect of this fermentation is found to be, that the mass is rendered more digestible and light, by which expression it is to be understood that it is

* Nicholson's Chemical Dictionary, Vol. I. p. 237.

is more porous by the disengagement of an elastic fluid that separates its parts from each other, as before explained, and greatly increases its bulk.

10. The operation of baking puts a stop to this process, by evaporating great part of the moisture, and probably also by still farther changing the nature of the component parts. Bread made according to the preceding method will not possess that uniformity which is requisite, because some parts may be mouldy, while others are not sufficiently changed from dough. The same means have been used in this case as have been found effectual in promoting the fermentation of large masses: this consists in the use of a leaven or ferment, which is a small portion of some matter of the same kind, but in a more advanced state of fermentation. After this leaven has been well incorporated, by kneading it into fresh dough, it not only brings on the fermentation with greater speed, but causes it to take place in the whole mass at the same time; and as soon as the dough has, by this means, acquired a due increase of bulk from the air which endeavours to escape, it is judged to be sufficiently fermented, and ready for the oven.

11. The bread principally used in this country is fermented with yeast, or the froth which rises on the surface of beer in the first stage of fermentation. When it is mixed with the dough, it produces a much more speedy fermentation than that obtained from leaven, and the bread is accor-

accordingly much lighter, and unless it is improperly prepared is never sour.

12. Having thus briefly touched upon the different kinds of bread, I now pass on to its preparation, which I shall divide into three kinds:

1. Unleavened bread.
2. Leavened bread.
3. Carbonic bread.

FIRST,

OF UNLEAVENED BREAD.

13. This is the bread that the Jews eat during their passover: the usage was introduced in memory of their hasty departure from Egypt*, when they had not leisure to bake leavened, but took the dough before it was fermented, and baked unleavened cakes. In Roman catholic countries it is still used, and prepared with the finest wheaten flour, moistened with water, and pressed between two plates graven like wafer moulds, being first rubbed with wax to prevent the paste from sticking, and when dry it is used.

TO MAKE UNLEAVENED BREAD.

14. Put a peck of flour into a kneading trough, three ounces of salt and a sufficient quantity

* Exodus, Chap. xii. ver. 14 to 17.

sufficient quantity of warm water; knead them well together till intimately blended, then roll the dough out into thin cakes, and bake them in a quick oven, in order to render them more porous, taking care to turn them during baking.

TO MAKE ARABIAN BREAD.

From M. Neibuhr's Travels through Arabia.

15. The modes of making bread are different in different parts of Arabia; but the following manner of pounding the grain, however troublesome, is in most general practice, and considered pleasanter to the taste than meal that has been ground in a mill. In the first place, two stones are procured, one convex and the other concave; the grain is then placed on the lower one, and a man bruises it till it is reduced to a meal; it is then mixed up with water, and divided into small cakes. In the mean time, an earthen pot, glazed on the inside, is filled with charcoal and set on fire, and when the pot is sufficiently heated, the cakes are laid on the outside of it, without removing the coals, and in a few minutes the bread is taken off, half roasted, and eaten hot.

The wandering Arabs of the desert, when they have not this convenience, use a heated plate of iron, or a gridiron, to bake their cakes; and when these are wanting, they roll the dough into balls, and put it into a fire of camel's dung, where it remains covered up till it is sufficient-

ly penetrated by the heat. Bad as this bread i it is better than the durra bread, which is in g neral use among the common people: it is mad of coarse millet, kneaded up with camel's milk oil, butter, or grease, pounded together, an then baked in the embers. M. Niebuhr ob serves, that he could not eat this bread at first but the people of the country being accustomec to its use, prefer it to barley bread, which they think too light.

SECONDLY,

OF LEAVENED BREAD.

16. This operation consists in keeping some paste or dough till the acetous fermentation takes place, when it swells, rarifies, and acquires a taste somewhat sour, and rather disagreeable. This fermented dough is then well worked up with some fresh dough, which is, by that mixture and moderate heat, disposed to a similar but less advanced fermentation than that above mentioned.

17. By this fermentation the dough is attenuated and divided, air is introduced, which being incapable of disengaging itself from the tenaceous and solid paste, forms it into small cavities, raises and swells it; hence the small quantity of fermented paste which disposes the rest to ferment is called the little leaven.

18. When the dough is thus raised, it is in a proper state to be put into the oven; where, while it is baking, it dilates itself still farther by

by the rarefaction of the air, and forms a bread full of eyes or cavities, consequently light, entirely different from the heavy, compact, viscous, and indigestible masses made by baking unfermented dough.

19. It often happens that bread made with leavened dough acquires a sourish and often disagreeable taste, which is said to proceed from too great a quantity of leaven, or from leaven in which the fermentation has advanced too far. This circumstance was explained in the last chapter, where it was stated, that unless the principle of acidity is generated, that it will not ferment at all. However, as it is a subject that deserves particular investigation, I propose, in the following experiments, to enquire if this disagreeable flavour, when it does occur, can be counteracted.

EXPERIMENT.

20. I took one pound of wheat flour and put it into a kneading trough, and mixed it up into a paste with eight ounces of water at the temperature of 65° of Farenheit's thermometer. This mixture was placed in 76 degrees of heat. In twelve hours no apparent change had taken place; but on examining it at the end of four-and-twenty hours, I observed several bubbles of air, which increased in number on kneading the dough, and on introducing the thermometer it stood at 70¼, an increase of 5¼° in the heat, in consequence of the fermentation.

21. At the expiration of thirty-six hours, I found

found this little leaven in a complete state of fermentation, and much thinner than on the preceding day; it was also of a sourish taste. I now added three pounds more flour, one ounce of salt, and a pound and a half of water by weight; the whole was now kneaded for about half an hour, and left to ferment again for six hours longer.

22. It was then made up into a proper consistence for baking, which required eight ounces more flour; and on weighing the whole, it turned out exactly six pounds, the quantity used in the experiment. My reason for determining its weight was, to ascertain whether, during fermentation, any sensible quantity of air was absorbed.

23. It was now divided into six equal portions, and made up into as many loaves. These were now placed in the oven, and after remaining in that situation half an hour, I found they were sufficiently baked *.

24. The loaves were now removed from the oven, taken off the tins, and placed on a board; one of them was wrapped in flannel, while the others were exposed to the air. When cold, they were all weighed, and turned out five pounds two ounces, fourteen ounces less than when put in the oven, and ten ounces more than the flour used in the experiment.

25. I now weighed the loaf that was covered with

* This is known by tapping with your finger on the bottom crust, and when done, the sound emitted is sonorous, but if not baked enough, dense. It is a sound difficult to be understood, and can only be learnt by practice.

with the flannel, and one of the others that had been exposed to the air; and, although they were of equal weights when taken out of the oven, yet now the one that was covered up proved to be four * scruples heavier than the other, making a difference of three quarters of an ounce in the quartern loaf.

26. I now cut them both asunder, and the bread looked porous, was tolerably light, and absorbed moisture readily; but the taste was sourish: it seemed as if a small quantity of vinegar had been mixed up with the dough, but still it was palatable.

27. On tasting the crusts, that which had been covered up was crisp and easily masticated, while the other was tough, dense, and in every respect disagreeable.

28. I now wished to try if I could make leavened bread without this sour taste, for in every other respect it was very palatable, for which purpose I made the following experiment.

EXPERIMENT.

29. I took one pound of flour, and mixed it up with eight ounces of water at the temperature of 68°. This was covered up, and set in a warm place for six-and-thirty hours, at the expiration of which time I found it in a state of fermentation, and quite sour. A quart of warm water was now added, and suffered to stand for twelve hours

* This is probably the reason why bakers are so solicitous to cover up their bread whilst hot.

hours more; the clear liquor was then decanted off, which had a taste similar to diluted vinegar, and a smell not unlike that emitted from an old pickle jar.

30. Twenty grains of prepared kali was then added to this liquor, which occasioned an effervescence similar to that observed in preparing saline draughts. When subsided, I again tasted it, but still continuing sour, twenty grains more were added, which destroyed the acidity completely; but to be convinced, by a chemical test, I introduced a paper dipped in tincture of turnsole, which it no longer turned red.

31. It was now evaporated to the consistence of honey, and put by for the night; in the morning, by the help of a glass, I could observe crystals of acetated kali.

32. From the result of these experiments, it may, with probability, be concluded, that, in making leavened bread, one * ounce of vinegar is generated from a pound of flour during the fermentation of the little leaven; but as this acid is not necessary, and indeed ought not to be present in good bread, it will be worth while to enquire by what means it may be destroyed, without impeding fermentation.

EXPERIMENT.

33. I took one pound of flour, and added a sufficient quantity of warm water: this was suffered

* I say one ounce, because it required forty grains of the prepared kali to saturate the liquor.

fered to ferment as the last (having ascertained what quantity of vinegar is generated in a pound of flour), I mixed up forty grains of prepared kali with a little warm water, and added it to the leaven; on kneading it together an instant increase of bulk was observable, during which time the carbonic acid gas, or the principle of yeast, was extricated; to prevent its escape, the dough was sprinkled with a little flour, and covered up with a cloth.

34. On examining it two hours after, I found it had increased in bulk amazingly, and was much more porous than common leaven. A pound more flour, and a quarter of an ounce of salt, were now added, and after standing two hours to prove, I divided it into two loaves, and put them in the oven.

35. When baked, I compared one of them with a loaf of leavened bread, which had the same quantity of flour in it, when it appeared considerably larger; and on cutting it open, was much lighter and more spongy than the common leavened bread, and had not the least taste of acidity.

36. From the result of these experiments it will evidently appear that if bakers, in those countries where yeast is scarce or unknown, were to add a certain proportion of prepared kali to their little leaven, a bread would be produced nearly similar to that produced in this country with yeast.

TO MAKE LEAVENED BREAD.

By the Hon. Capt. Cochrane.

37, Take a piece of dough, of about a pound weight, and keep it for use—it will keep several days very well. Mix the dough with some warm water, not very hot, and knead it up with some flour to ferment and sponge; then take half a bushel of flour, and divide it into four parts; mix a quarter of the flour with the leaven, and a sufficient quantity of water to make it into dough, and knead it well. Let this remain in a corner of your trough, covered with flannel, until it ferments and rises properly; then dilute it with more water, and add another quarter of the flour, and let it remain and rise. Do the same with the other two quarters of the flour, one quarter after another, taking particular care never to mix more flour till the last has risen properly. When finished, add six ounces of salt; then knead it again, and divide it into eight loaves, making them broad, and not so thick and high as is usually done, by which means they will be better soaked. Let them remain on the board to rise, in order to overcome the pressure of the hand in forming them; then put them in the oven, and reserve a piece of dough for the next baking. The dough thus kept may, with proper care, be prevented from spoiling, by mixing from time to time small quantities of fresh flour with it.

THIRDLY,

THIRDLY,

OF CARBONIC BREAD.

38. The invention of beer, or the wine of grains, furnishes a new matter useful in making bread; this matter is the froth or yeast formed upon the surface of these liquors during fermentation. When it is mixed with the dough, it rises better and more quickly than ordinary leaven, and by means of this the finest and lightest bread is made.

39. Bread well raised with yeast and baked differs from the preceding kinds, not only in being less compact, lighter, and of a more agreeable taste, but also in being more miscible in water, with which it does not form a viscous mass, which is of the greatest importance in the process of digestion, as already observed.

40. There are several preparations of this kind of bread, made not only with wheat flour, but also with barley, rye, oats, buckwheat, maize, rice, beans, and potatoes, the principal preparations of which will be detailed in their proper order.

THE COMMON FAMILY WAY OF MAKING BREAD.

41. To half a bushel of flour add six ounces of salt, a pint of yeast, and six quarts of water

that has boiled, in warm weather; put the water in nearly cold, but in winter, when the weather is very cold, let it be as warm as the hand can be endured in it without causing pain, and in temperate weather, observe a mean between the two extremes. This is deemed a proper proportionate mixture, and the mode of proceeding is as follows:

42. Put the flour into a kneading-trough, or other vessel used for the purpose, and make a hole in the middle of the flour, put the water into it; to which add the yeast and salt, stir them together, and mix up the flour with it till the dough becomes of a very thick consistence. Cover the whole up warm to ferment and rise (particularly in cold weather). This is called setting the sponge, and on a due management of this part of the business depends the goodness of the bread.

43. After letting it lie a proper time in this state—an hour and a half, more or less, according to the state of the weather, knead it well together, be not sparing of labour, and afterwards lay the whole thick at one end of the kneading-trough, and let it lie some time longer covered up. During this part of the process, the oven must be heated; when that is effected, and properly cleansed from ashes, cinders, &c. make the bread into eight loaves, and place them in the oven as expeditiously as possible, observing to leave a little fire on one side of the mouth of the oven to give light while setting, and also to prevent the external air from cooling it. Stop the oven up close, and

and draw the bread out when baked. The proof of its being well fermented and baked will appear on putting a slice in water; if it is good bread, it will dissolve entirely into a pap in the course of a few hours, without rendering the water turbid or mucilaginous.

TO MAKE FRENCH BREAD.

44. Put a pint of milk into three quarts of water; in winter let it be scalding hot, but in summer only a little more than milk warm. Then take a quarter of a pound of salt and a pint and a half of good ale yeast; stir them into your milk and water, and then with your hand break in a little more than a quarter of a pound of butter: work it well till it be dissolved, then beat up two eggs in a bason, and stir them in. Take about a peck and a half of the finest wheaten flour called Hertfordshire Whites, and mix it with your liquor. In winter your dough must be pretty stiff, but more slack in summer, so that you may use a little more or less flour according to the stiffness of your dough, but mind to mix it well, and the less you work it the better. You must stir the liquor into the flour as you do for pie crust, and after your dough be made, cover it with a cloth, and let it lie to rise while the oven be heating. Make it up into bricks or loaves, and put them into the oven; when they have lain about a quarter of an hour, turn them to the other side, and let them lie a quarter of an hour longer. When done, do not cover them

up as bread usually is, but leave them on the board till they are cold, then chip them all round with a knife, which will be better than rasping, and make them look more spongy, and of a fine yellow colour; whereas the rasping takes off that fine colour, and makes the bread look too smooth.

TO MAKE BROWN WHEATEN BREAD.

By Sir John Call.

45. Suppose a Winchester bushel of good wheat weighs fifty-nine pounds, let it be sent to the mill and ground entirely down; including the bran, the meal will then weigh fifty-eight pounds, for not more than a pound will be lost in grinding; it must then be mixed up with water, yeast, and salt, and the dough weighed before it is put into the oven, which will appear to be about eighty-eight pounds. Let it be divided into eighteen loaves, put into the oven, thoroughly baked, and after they are drawn out and left two hours to cool, they will weigh seventy-four pounds and a half.

46. The bread thus made will be found excellent, and fit for any household use; and was the broad bran to be taken out, of which there may be about five pounds in a bushel of wheat, thus manufactured, it would produce sixteen loaves and a quarter.

TO

TO MAKE BREAD WITH ALL THE BRAN ADDED TO IT,

SO AS GREATLY TO INCREASE THE QUANTITY.

By T. Bernard, Esq.

47. Take seven pounds of bran and pollard, and fourteen quarts of water; boil the whole very gently over a slow fire. When the mixture begins to swell and thicken, let it be frequently stirred, to prevent its burning to the bottom or sides of the pan. With two hours boiling it will acquire the consistence of a custard pudding; then put it into a clean cloth, and twist it until the liquor is squeezed out; with a quart of which mix three pints of yeast, and set the sponge for twenty-eight pounds of flour. The bran and pollard, which, when the liquor has been squeezed out, is above four times its original weight before it was boiled, is then to be set near the fire, in order that it may be kept warm. In about two hours the sponge will have sufficiently risen, upon which the bran and the pollard (then lukewarm, but not hot, and into which is to be sprinkled about half a pound of salt) should be mixed with the flour, and the whole kneaded up very well together with a quart of the bran liquor, and it should then be baked for two hours and a quarter in a common oven.

48. The produce weighed, when cold, will be half as much again as the same quantity of flour would produce in the common way, without the addition

addition of the bran. Most of the objections to the use of bran in bread appear to be founded on a presumption that no mode of preparation will make any difference in the degree of nutriment to be derived for it as food. Though the subject is as yet but little understood, yet we have gone far enough to ascertain the fact, that, in most kinds of grain, some increase of the ordinary nutritive power may be produced by culinary process: the very making of bread affords an example of this increase. In rice it is very great, and in barley meal, particularly when used in soup, its increased power of nutriment may be extended to a surprising degree; and as it is now well known that rice, when increased by water to a solid substance of five times its original weight, or by the addition of milk to eight times what it originally weighed, is converted from a hard indigestible grain into a wholesome nourishing food.

TO MAKE PAN BREAD.

49. Put a peck of fine flour, called Hertfordshire Whites, into a wooden bowl that has been previously warmed. Let it stand before the fire for about an hour, then mix up a sufficient quantity of salt and yeast with warm water, and make up the bread at once, instead of setting a small quantity to work in the first instance, as is generally practised. In this way it stands covered with a cloth before the fire for about three hours; it is then made up into loaves, and put in

in earthenware pans, and set into a quick oven. When well soaked, and nearly done, they are taken out of the pans and set on tins for a few minutes, in order that the crust may become brown; they are then taken out, and wrapped in flannel, and when cold rasped.

Bread made in this manner is much lighter than the common baker's bread, and when cut, puts on the appearance of a honey-comb. It is necessary to remark, that the dough must by no means be near so stiff as usual.

TO MAKE JEW BREAD.

50. Being at a Jew's one morning when they were preparing the bread for their sabbath, and having often before admired the singularity of its appearance, I had the curiosity to wait to see the whole process. The sponge was set in the usual manner, with wheat flour, yeast, water, and salt, and when it was ready to make up into loaves, they took five pieces of equal size, and rolled them out a considerable length in the shape of a rolling pin to a tapering point. These five pieces were then platted together, beginning in the middle, and when complete laid aside. Five other pieces of similar shape were then rolled out about four times the size of the former, and platted in the same way; and I observed that the women rolled each piece with such exactness and dexterity, that they all met in a point, which were united by a pinch. The first platted cake was then placed upon the large

large one, and over this another piece of dough about a third of an inch in diameter, and the length of the largest cake. This was run over the top from point to point, and was fastened to the middle by a coil of dough, with two thin bars laid over it in form of a cross, the whole together making a very handsome appearance. An egg was then broke and whipped up with a fork, and then spread over the cake with a painting brush, which produces that shining appearance so much admired. A few white poppy seeds were then sprinkled over it, and it was then placed in the oven and baked the usual time.

TO MAKE BREAD THAT WILL NEVER BE BITTER.

By Mr. James Stone.

51. It frequently happens, in the summer season, that the brewers, in order to prevent their beer from turning sour, are obliged to use more hops than usual; the consequence is, that the yeast is very bitter, and gives a disagreeable flavour to the bread. To obviate this inconvenience, Mr. Stone has recommended the following method of raising a bushel of flour with only a tea-spoonful of yeast.

52. Suppose you want to bake a bushel of flour, put it into your kneading trough, then take about three quarters of a pint of warm water, and one tea-spoonful of yeast. Stir it in till

till it is thoroughly mixed with the water; then make a hole in the middle of the flour, large enough to contain two gallons of water. Pour in your small quantity; then take a stick, and stir in some of the flour until it is as thick as you would make for a batter pudding; then strew some of the dry flour over it, and go about your usual business for an hour. Then take a quart more of warm water, and pour in; for in one hour you will find that small quantity raised, so that it will break through the dry flour you shook over it; and when you have poured in your quart of warm water, take your stick as before, and stir in some more flour until it is as thick as before; then shake some more dry flour over it, and leave it for two hours more, and then you will find it rise and break through the dry flour again; then you may add three quarts or a gallon of water, and stir in the flour, and make it as thick as at first, taking care to cover it with dry flour again, and in about three or four hours more you may mix up your dough, and then cover it up warm; and in four or five hours more you may make it up into loaves, and put it in the oven, and you will have as light a bread as though you had used a pint of yeast.

53. It does not take above a quarter of an hour more than the usual way of baking, for there is no time lost but that of adding the water three or four times. The author of this method assures us that he constantly bakes in this way. In the morning, about six or seven o'clock, he puts the flour in the trough, and mixes up the spoonful of yeast with the warm water; in an hour's

hour's time some more, in two hours more, and about noon makes up the dough, and about six in the evening it is put into the oven, and he has always good bread, never heavy or bitter.

TO MAKE WHEATEN BREAD.

As practised by the Bakers.

54. As it was my wish to be particularly acquainted with the several minute circumstances respecting this branch of the art, I procured access to a bake-house that had the reputation for making exceeding good bread.

55. I went there about two o'clock in the afternoon; soon after, nine faggots of wood were put into the oven to get dry, and the copper warming-pot* being filled with water, was placed there also. At three o'clock they prepared to set the sponge, for which purpose two sacks of household flour were emptied into the kneading trough; it was then carefully sifted through the brass wire sieve, which made it lay much lighter than before. The following mixture was then prepared. Two ounces of rockey† was

* For an explanation of this and several other technical terms, see chap. 9.

† The reason given for adding the alum was, that it saved kneading, but it ought to be discountenanced, as it is very apt to produce an obstinate costiveness; and the late Dr. Leake, in his Treatise on the Diseases of the Viscera, asserts, from his own knowledge, that jalap is frequently added

was first put into a tin pot, and dissolved over the fire in a little water, which bakers call liquor; this was poured into the seasoning tub, and nine pounds of salt was thrown in, over which they poured two pails full of hot liquor; when cooled to 84 degrees of Farenheit's thermometer, six pints of yeast was added; the composition was then stirred well together, strained through the seasoning sieve, and emptied into a hole made in the flour, when it was mixed up with it to the consistency

added to counteract the astringent quality of the alum. Other reasons have been given for this addition, which appear very plausible; one is, that when alum is mixed with new wheat, it makes the flour of new equal to that of old. Another is, that the London bakers use it to clear the river water, which is frequently muddy. There is a heavy penalty annexed to this species of adulteration, and any person that suspects his bread contains this drug or any other, may convince himself by the following simple experiment. Take a loaf of bread, and cut it into thin slices, and put it into a saucepan full of water. Set it in a sand bath, or other very warm place, without shaking, for twenty-four hours; the bread will, in this time, soften in all its parts, and the ingredients will separate from it. If any jalap has been used, it will swim on the top in a coarse film; if any chalk or whiting, it will sink to the bottom; and when the water is poured away, the addition of a little vinegar will occasion a fermentation like the working of yeast. The water that is poured off is to be filtered, and afterwards evaporated to the consistency of honey; and when put by in a cool place, the alum will crystalize, and by weighing it you may determine the exact quantity that a loaf contains. Dr. Darwin thinks, that when much alum is mixed with bread, it may be distinguished by the eye in the place where two loaves have stuck together in the oven; they break from each other with a much smoother surface than those loaves which do not contain alum.

consistency of a thick batter. Some flour was now lightly sprinkled over the top, when it was covered up, with two or three sacks, to keep in the heat. This operation is called setting quarter sponge.

56. It remained in this situation till six o'clock in the evening, when I observed it had swelled to a considerable size and broke through the flour; two pails full more of warm liquor were now stirred in, and the mass was covered up as before. This second stirring in, is termed setting half sponge

57. At eleven o'clock at night five more pails full of warm liquor were added, and when the whole was intimately blended, it was kneaded for upwards of an hour. The dough was then cut into pieces with the knife, and thrown over the sluice board and penned to one side of the trough; some dry flour being sprinkled over, it was left to prove till about three o'clock in the morning, when it was again kneaded for the space of half an hour. The dough was then taken out of the trough with the arms, put on the lid and cut up into pieces, and what stuck to the sides and bottom was removed with the scraper. It was then weighed, and four pounds fifteen ounces was allowed for each quartern loaf; the baker observing, that a loaf of that size, loses from ten ounces and a half to eleven ounces, while in the oven. It was then worked up, and the separate masses were laid in a row till the whole was weighed, and, on counting them afterwards, I found they were equal to one hundred and

and sixty-three and a half quartern loaves; but this circumstance, I understand, is variable*, as some flours knead better than others; some sacks shall produce from eighty-one to eighty-two and a half quartern loaves; while others shall scarce make eighty; hence the law has directed the magistrates who set the assize, to make the calculation from eighty loaves to a sack of flour.

58. I should have mentioned, that the fire was kindled at two o'clock, and continued burning till near four, when, the wood being converted to an ash, the rooker was put into the oven and the ashes drawn up to the mouth; the hoe then scraped out what escaped the rooker, and all the ashes were thrown with the spade into the ash-hole, except a few that were left at one corner, to light the man who set in the bread. The swabber was now introduced, which cleaned out the bottom of the oven, and left it perfectly free from dirt and ashes.

Two men now began to mould† up the loaves, while a third took his station at the mouth

* A variation of temperature makes a considerable difference to the bakers profit or loss, in converting flour to bread. In summer, a sack of flour will yield a quartern loaf more than in winter; and the sifting it, before it is wetted, if it does not make it produce more bread, certainly causes the loaves to be larger.

† The operation of moulding is peculiar, and can only be learnt by practice; it consists in cutting the mass of dough destined for a loaf, into two equal portions: they are then kneaded either round or long, and one placed in a hollow made in the other, and the union is completed by a turn of the knuckles on the centre of the upper piece.

mouth of the oven, who marked each loaf with a large Roman W as it was removed to him, and then placed it on the quartern peele, and carried it to the upper end of the oven, where it was left and the peele withdrawn. The next loaf was placed by the side of the first, and they went on, moulding, and delivering, till the whole was set in. The door was now close stopped up till seven o'clock, when it was unclosed; and, the drawing peele being carried under, a part of the batch was obliquely elevated, which separated three or four loaves from their adhesion to the others, when they were withdrawn, having been in the oven about three hours. The remainder were separated and removed, in the same manner, and then turned with their bottoms upward to prevent them from splitting, and covered with flannel till wanted for sale.

TO MAKE ROLLS,

As practised by the Bakers.

59. After the bread was placed in the oven, they prepared to set sponge for a bushel of flour, which was sifted, and mixed in the same manner, and with the same flour, as was done for the bread: at half past six o'clock they were moulded up, and a slit was cut along the top of each with a knife; they were then set in rows, on a tin, and placed in the proving oven to

to rise, till seventeen minutes before eight o'clock, when they were drawn and set in the oven, which was closed, as before; at eight o'clock they were drawn, and the moment they were taken out, they were slightly brushed over with a buttered brush, which gave the top crust a shining appearance, and then covered up with flannel till wanted for sale.

TO MAKE FRENCH ROLLS,

As practised by the Bakers.

60. Put a peck of flour into the kneading trough, and sift it through the brass wire seive, then rub in three quarters of a pound of butter, and, when it is intimately blended with the flour, mix up with it two quarts of warm milk, a quarter of a pound of salt, and a pint of yeast; let these be mixed with the flour, and a sufficient quantity of warm water to knead it into a dough; it must then stand two hours to prove, and then be moulded into rolls or bricks, which are to be placed on tins, and set for an hour in the prover. They are then to be put into a brisk oven for about twenty minutes, and when drawn rasped.

TO MAKE HOUSEHOLD BREAD,

As practised by the Bakers.

61. Household bread undergoes the same preparation as that for wheaten bread, with this dif-

difference, that, instead of being made of fine white flour, it is made of an inferior sort, called seconds flour, and the loaves, instead of being marked with a W are, in conformity to act of parliament, marked with an H: and bakers neglecting to make this distinction are liable to be fined; but, like all good laws, it is sometimes evaded by mixing the two flours together and making the mixture into white bread, which is coloured with chalk or whiting *, that the fraud may not be detected.

TO MAKE STANDARD WHEATEN BREAD.

As practised by the Bakers.

62. Send a quarter of wheat to the mill, and let the miller so grind and dress it that the flour shall weigh three † fourth parts of the wheat from whence it was made without any mixture or addition; then let it undergo the same preparation as that for wheaten bread, only before the loaves are put into the oven let them be marked S. W. If this flour is properly ground, and the bread well made, it will be of a yellowish cast or tint, and far more nourishing than any bread that can possibly be devised.

CHAP.

* Leake's Treatise on the Diseases of the Viscera, p. 83.
† 13. Geo. 3. Chap. 62.

CHAP. VII.

ON THE SUBSTITUTES FOR WHEATEN BREAD.

SECT. I.

WITHIN these few years past an inquiry has been instituted in these kingdoms, to ascertain if there are any other kinds of grain that can be made up into bread, to answer, in every respect, the purposes of that made from wheat. The principles on which these inquiries have been conducted, are as judicious as the subject is important; and it is highly probable that many good effects will take place in consequence thereof; not in this country only, but in every part of the universe, where men live together in civilised society.

2. It is proper to remark, that this inquiry was pursued in order to obviate, if possible, the late excessive high price of wheat; and prevent, as far as circumstances would allow, the effects of it from falling so heavily on the lower and middle classes of the community. The Board of Agriculture, for which posterity will thank them, in terms of the highest approbation, turned their attention to, and took into consideration, the great question of substitutes for wheat, in the manufacture of bread; and, for that purpose, made a great variety of experiments to ascertain the respective qualities of barley, rye, oats, buckwheat, maize, rice, beans, peas, and potatoes; and to discover their ope-

operation on each other, in correcting, by means of one, the defects of another; and as many of these observations have been presented to the public, in detached pieces, it will be requisite to collect and arrange such as are really useful in practice; as it is very improbable that such another opportunity will ever occur again.

3. The Board, likewise, in order to ascertain what each of the above sorts of grain would really produce, when ground into a flour, with only the broad bran taken out, caused a bushel of each sort to be purchased and ground, for their inspection:—the weights of the grain, as well as the bran and the flour, are as follows.—

GRAIN.	Weighed	Weight of Flour	Weight of Bran.
	lb.	*lb. oz.*	*lb. oz.*
1 One bushel of Barley	46	38....10½	5....10½
2 Ditto of Buckwheat	46¼	38.... 9	5.... 5
3 Ditto — Rye	54	43.... 0	9.... 5½
4 Ditto — Maize	53	44.... 0	8....10½
5 Ditto — Rice	61¼	60.... 5	
6 Ditto — Oats	38¼	23.... 5	13....10½
7 Ditto — Beans	57¾	43.... 5½	12.... 0
8 Ditto — Peas	61¾	47.... 0	12.... 5
9 Ditto — Potatoes.	58½	8.... 0	
10 Miscellaneous Substitutes for Bread.			

From the result of these enquiries they found, that each sort of flour, thus procured, when separate from the bran, might be had as follows; without deducting any thing for the value of the bran, as that would always pay for the expence of grinding.

Table

TABLE of the value of different sorts of flour per pound, when the grain is at the following prices per bushel.

SORTS.	Price per bushel of grain.		Price per lb. of the flour.	
	s.	d.	s.	d.
One bushel of Barley - - - - -	at 5	6	0	1½
Ditto of Buck-Wheat - - - - -	at 6	0	0	1¾
Ditto — Maize - - - - - - - -	at 7	6	0	2
Ditto — Rye - - - - - - - - -	at 6	6	0	1¾
Ditto — Rice - - - - - - - - -	at 23	0	0	4
Ditto — Oats - - - - - - - - -	at 4	0	0	1
Ditto — Beans - - - - - - - -	at 5	6	0	1½
Ditto — Peas - - - - - - - - -	at 10	0	0	3¼

Potatoes are uncertain, as the flour depends materially on the sort that is ground; but on a general calculation, a bushel may be said to produce eight pounds of flour, which would make it at least four-pence a pound when they are half a crown a bushel.

4. In order, therefore, to prosecute this enquiry with clearness and precision, I shall notice each of the kinds of grain above enumerated in the order as set down in the table, beginning with its natural history, mode of cultivation, and manner of making into bread, with a statement of its good or bad qualities, and then its several combinations with other sorts of flour or potatoes.

FIRST,

OF BARLEY.

5. Barley is employed as a part of diet in many parts of this country. Next to wheat, it is the most profitable of the farinaceous grains, and when mixed with a small proportion of that flour, makes as light and as good a bread as that grain, and infinitely cheaper; but bread made of barley flour is not so spongy, and feels heavier in the hand than wheaten. But this can be no proof that it is not equally nutritious, as it is a well-known fact that thousands of the healthiest and most robust peasants that this country can produce never taste any other bread than that prepared from this grain.

6. Barley delights in a sandy loam: hence the light soil of Norfolk * is peculiarly adapted to this grain, which is no where produced in greater perfection than in that county. It generally succeeds wheat, the land being broke up as soon after Christmas as it will admit the plough. In the beginning of March it is harrowed, and soon after it is well plowed again and laid up in ridges. In April, this operation is again repeated, the husbandman afterwards taking care to render, with the harrow and roller, the entire surface as even and level as possible. Sometimes the ground is only plowed once,

* Marshall's Rural Œcon. of Norfolk, vol. i. p. 223.

once, and the seed sown above; but more frequently it is broken by three plowings, notwithstanding they may not have more than a week to perform them in. This, at first sight, appears an injudicious practice, the plowings being so quick upon each other, neither the root weeds have time to wither, nor the seed weeds to vegetate *. But this being a frequent practice of some of the best farmers in the district, we may be assured that two plowings and harrowings are not wantonly thrown away.

7. The Norfolk farmers are in general masters of the art of cultivating barley. They seem fully aware of the tenderness of this plant, in its infant state, and of its rootlings being unable to make the proper progress in a compact or a cold soil; they therefore strive, by every means in their power, to render the soil as fine as ashes, and fit for the reception of the seed. The proper time for sowing the seed is from the middle of April till towards the middle of May, but the time depends in some measure upon the season; the true period is just before the oak puts on that sallow appearance, which it does at the time the buds are breaking previous to the expansion of the leaves. Three bushels are usually allowed to an acre, and sown broadcast; it is then plowed under with a shallow furrow, a practice almost peculiar to Norfolk, but which is an admirable practice in soils light enough to produce good barley, provided the seed is not buried too deep. If the season, however, is wet, and the soil cold and heavy, the seed should

* See page 4.

be cast upon the surface, and then harrowed and rolled, as is the practice in other districts.

8. Nothing farther is required to be done till harvest, unless the weeds are considerable, when they are to be removed by the hand. The grain is suffered to stand until it is quite ripe, when it is mown into a swath, with a small bow fixed in the heel of the scythe. If barley receives wet in the swath, it is not turned, but lifted; that is, the ears are raised from the ground with a fork to admit the air underneath, and then suffered to fall gradually again. This management is supposed to stop the ears from vegetating, nearly equal to that of turning, which requires more labour, besides breaking and ruffling the swaths, which, by repeated turnings, lose their stiffness, become weak and flabby, and adhere closer to the ground, in which state the corn presently begins to sprout. When the swaths are become thoroughly dry and stiff on the upper side, they are turned, that the other side may get into the same state, and as soon as the weather is suitable, it is gathered up with strong rakes, and pitched into the cart. The ground is then raked over, either by hand or with a drag rake drawn by a horse, to collect such loose ears as are scattered upon its surface.

9. It is necessary to remark, that, in grinding barley to flour, the French * stones should be used in preference to any other, as experience has ascertained that they produce flour of a brighter colour, and preserve what the bakers term

* Chamberlain's Letter to Sir John Sinclair.

term the life of the flour; and they are of opinion, that barley ground with these stones raises the bread in the oven to the greatest height it can possibly be brought to.

10. No chemical analysis has yet been made to ascertain the composition of barley flour, but we have every reason to believe that it is either destitute of the glutinous substance of wheat, or possesses it in a very trifling degree. With respect to the starch, on which its nutritious properties principally depend, that consists of the most considerable part of the grain; and there can be no doubt, from the facility with which it is converted into malt, that the saccharine extract is in much greater quantity than in wheat. Supposing this statement to be correct, whoever requires a light porous bread to be made from barley, will find it necessary either to add some of the glutinous substance of wheat, which may be obtained at the starch manufactories; or, what is more commonly practised, a certain proportion of fine wheaten flour. Other substances are sometimes made up with barley into bread, but that bread must necessarily be heavy, unless they contain this peculiar gluten, without which no light porous bread can be made. To remedy this defect, it is always best to set the sponge with wheat flour altogether, as barley flour does not readily ferment with yeast, and then add the barley flour, when the dough is going to be made. Bread made in this way requires to be kept a longer time in the oven than wheaten bread, and the heat should also be somewhat greater.

TO MAKE BARLEY BREAD.

By Sir John Call.

11. Suppose a bushel of barley to weigh fifty-two and a half pounds, let it be sent to the mill, and have the bran, which is unfit for the composition of bread, taken out, which, with what is lost in grinding and dressing, will probably reduce it to forty-four pounds. Let this meal be kneaded up into dough, with water, yeast, and salt, and divided into eight loaves, and when thoroughly baked, drawn out of the oven, and left two hours to cool; they will weigh about sixty pounds.

12. This barley bread is very good, and is such as is eaten by many of the farmers in Devonshire and Cornwall, by most of the labourers in husbandry, and by almost all the miners, even when wheat was much more plentiful, and not above half the price it was during the season of scarcity.

TO MAKE MIXED BREAD.

By Dr. Pennington.

13. Take fourteen pounds of barley flour, and the same quantity of the pulp of potatoes*. Let them

* The pulp of potatoes is prepared by paring of potatoes, and then grating them down into an earthen vessel, and

them be kneaded up into a dough with warm water, and a sufficient quantity of yeast and salt; and, after standing the usual time to prove, they will be found to weigh twenty-eight pounds.

TO MAKE MIXED BREAD.

14. Take two pecks of barley flour, and one peck of rice flour. Let these be kneaded up into a dough, and baked in the usual way, when they will be found to produce a very good and nourishing bread.

TO MAKE MIXED BREAD.

From the Reports of the Board of Agriculture.

15. Take four bushels of wheat ground to one sort of flour, extracting only a very small quantity of the coarser bran. Add three bushels and a half of barley flour, bolted through a twelve or a fourteen shilling cloth; then mix them up into a dough in the usual manner, with salt, yeast, and warm water, and let it be divided into

and pouring water upon them. This is to be poured off in about three hours, as it has a disagreeable earthy taste, and fresh water poured on, which, when changed, will be found nearly clear and insipid. The pulp is then to be taken out and put in a sieve, that the water may drain from it, and when tolerably dry, it will be fit to mix with the flour.

into half peck loaves, and put into the oven hotter than it would be made for wheaten bread. Let them remain in three hours and a half, when it will be found a very wholesome nourishing bread. In Yorkshire, bread made from a mixture of these grains is esteemed more wholesome to persons in general than that which is made from wheat alone.

SECONDLY,

OF BUCKWHEAT.

16. Buckwheat is so little * used as an aliment in this country, that there is little opportunity of studying its effects; but, from all appearance, it has the common quality of the other species of grains. A considerable quantity is annually grown in Norfolk, perhaps more than in all the other parts of the kingdom besides; but it is principally consumed by swine and poultry, both of which it fattens quick and well. In France, particularly in Brittany †, it is much used, and is there accounted a very wholesome and nourishing grain; and when properly ground, makes an agreeable and nutritive bread.

17. This grain is sown indiscriminately on all soils, except that light ‡ poor land has the preference.

* Cullen's Mat. Med. Vol. I. p. 236.

† Account of the Experiments tried by the Board of Agriculture, p. 13.

‡ Marshall's Rural Œcon. of Norfolk, Vol. I. p. 253.

ference. Indeed, it is to this species of soil that buckwheat seems most especially adapted. It may be sown after any species of grain, provided that the land is tolerably clean; but even this circumstance is not absolutely essential to its well-doing, as its growth is so rapid, that it outstrips and smothers almost every kind of weed. In general, the land is plowed as for barley, and from six pecks to two bushels is sown broadcast. The management of the land, and the harvest process, require no particular description, as it is in every respect similar to that of barley.

18. A peculiarity attends the management of this grain at the mill, which, if not attended to, the flour will never make a bread that is any way palatable. The following account of the mode of grinding and using buckwheat in Brittany was communicated to the Board of Agriculture by an intelligent emigrant from that province. In the first place, if the heat of the sun is not sufficiently powerful to cure it properly, it must be dried on a kiln, and then as much is sent to the mill as is wanted for a fortnight or three weeks at farthest. The miller is careful to grind in the first instance, so as to separate the meal and the bran from the black, hard, and triangular husk, without grinding it down: for this purpose, he places the stones in such a manner as only to press lightly, which takes off the husk, a process termed running it through the mill-stones. The farinaceous part of the grain is then easily separated from the husk by winnowing. This process being over, he

proceeds with his grinding and dressing, the same as with any other grain.

TO MAKE BUCKWHEAT BREAD.

From the Reports of the Board of Agriculture.

19. Take a gallon of water, set it over the fire, and when it boils, let a peck of the flour of buckwheat be mixed with it little by little, and constantly stirred, so as to prevent any lumps from being formed till a thick batter is made like that of Scotch or Yorkshire pottage. Some salt is now to be added, then set it over the fire, and allow it to boil an hour and a half. The proper proportion for a cake is then to be poured into an iron kettle that hangs over the fire, and baked, taking care to turn it frequently, lest it should burn.

TO MAKE MIXED BREAD.

From the Same.

20. Take a peck of the flour of buckwheat, mix it, and boil with water in the manner above described. While this process is going on, let a peck of wheat flour be put in a kneading trough, and rather more than the usual proportion of yeast mixed with it. When the batter is boiled enough, it should be taken off the fire, and when cooled to the degree of blood heat, should be

be poured into the trough with the wheaten flour and yeast: the whole should now be well kneaded, and stand two hours to prove, when it is to be divided into loaves and baked, remembering to keep it in the oven rather longer than wheaten bread.

21. Bread made in this manner can be safely recommended, as certainly at least not less nutritious, and perhaps more palatable, when properly baked, than any other; but to have it light and good, it requires a little address, and some experience, otherwise it will be heavy and compact.

THIRDLY,

OF RYE.

22. Rye is a grain whose cultivation is not much encouraged in this kingdom, but in the northern * parts of Europe it is in very extensive use as a nourishing food for mankind. When made into bread alone, it is of a dark brown colour and sweetish taste, and if eat by people unaccustomed to its use, it is found to have a laxative effect. In some parts of this kingdom, a mixture of rye and wheat is reckoned an excellent bread. In Yorkshire †, bread made from a mixture of these two grains is esteemed

* Cullen's Mat. Med. Vol. I. p. 228.

† Marshall's Rural Œcon. of Yorkshire, Vol. II. p. 15.

esteemed more wholesome than that which is made from wheat alone; and in Nottinghamshire*, opulent farmers consume one third wheat, one third rye, and one third barley, but their labourers do not relish it, and have lost their rye teeth, as they express themselves; but as it is known to be a wholesome and nutritious grain, its consumption cannot be too strongly recommended.

TO MAKE MIXED BREAD.

23. Take a peck of wheat flour, and the same quantity of rye flour. Let these be kneaded together with a sufficient quantity of yeast, salt, and warm water. It should be covered up warm for two hours, to ferment, and then divided into large loaves, and baked in the usual way.

TO MAKE A GOOD HOUSEHOLD BREAD.

From the Reports of the Board of Agriculture.

24. The following mode of making a new kind of household bread has been found to answer extremely well. Suppose a bushel of rye to weigh sixty pounds, to that add one-fourth part, or fifteen pounds of rice. This, when ground down, and only the broad bran taken out,

* Account of Experiments tried by the Board of Agriculture, p. 12.

out, which seldom exceeds four and a half or five pounds for that quantity, is thus prepared for houshold use.

25. Take fourteen pounds of this flour, a sufficient quantity of yeast, salt, and warm water, and let it be made up and baked in the usual way, and it will be found to produce twenty-two pounds weight of bread, which is a surplus of three pounds and a half in fourteen pounds, over and above what is usually produced in the common process of converting household wheat flour into bread.

26. In this preparation, the astringent property of the rice corrects the laxative quality of the rye, and makes it equally strong and nourishing as the same weight of common wheaten bread.

FOURTHLY,

OF MAIZE.

27. Maize, or Indian corn, is an annual * plant growing in Turkey, America, Germany, and various other countries. It is nearly as large as horse beans, being somewhat flat and flinty, of a yellowish white colour, sometimes red, and sometimes speckled. It is contained in ears from eight to sixteen inches long, and from four to seven inches in circumference. In the middle is a hard substance, called a cob, on which the grains

* Smith's Tour in the United States of America, Vol. I. p. 295.

grains grow close together at right angles from it, and not obliquely, like wheat, barley, or rye. On each ear there are always twelve or sixteen rows, and the whole is covered with a thick, strong, white husk, composed of three or four leaves or coats, which adhere to the whole very closely, and are each something more than the whole ear in length, to which they are united at the stalk, or lower extremity.

28. Maize is neither sown nor reaped, but is planted and gathered. The ground for it is first plowed over one way; this is crossed by furrows five or six feet asunder, and these by other furrows at right angles, and at similar distances, which divide the whole field into squares of five or six feet every way. In each crossing three grains of corn are dropped, and covered with a hand hoe: this is performed some time in the month of May, and is termed planting of corn. It is afterwards plowed across the first furrows; the next plowing is across these, and so on alternately until it is all plowed five times over; then it is weeded, and hoed round the roots of the stalks with broad hand hoes, and this is called laying by the corn. In August and September it begins to blossom and shoot out ears, which is called to tassel, because beautiful shining silky tassels come out from the extreme end of the ears, and hang waving down; these are the female flowers, and proceed from the joints from the height of three to six feet above the ground. There is also another beautiful blossom at the top of the whole, which is the male flower. This state of the plant is denominated.

minated, the corn being in silks. In October, the corn begins to ripen; the leaves, which are then broad and long, are pulled off, and tied in bundles, being left in the field to cure, and are used as provender for horses. Towards the latter end of November, and all December, after the frosts have come on, the corn is gathered, two, three, and four ears from every stalk; and the stalks, each of which is above an inch in diameter, is left standing in the field. A bushel of this corn will plant nearly twenty acres, and on the richest lands twenty acres will produce one thousand two hundred and fifty bushels.

29. No direct experiments have been made to ascertain the component parts of the meal of maize; but as it possesses but little sweetness, and does not ferment with yeast so as to make a light bread, we may conclude that it either wants the saccharine principle and the glutinous substance, which render wheat so susceptible of fermentation, or that it possesses them in a very small degree. At the same time it affords an abundant quantity of starch of the best quality, the imperfections of which may be easily corrected by adding a proportion of wheat flour to it, when it may be fermented into a perfect bread.

TO

TO MAKE INDIAN HOE CAKE.

By Captain Smith.

30. Take a peck of maize flour, knead it with a little salt and some water, into a dough; roll it out into thin cakes, and let them be baked on a hot broad iron hoe.

31. This bread is in common and daily use throughout the whole continent of North America. To strangers it has a harsh unpleasant taste, but the natives most commonly prefer it to wheaten bread. At first it has a laxative effect, but that diminishes by use, and at any rate can be easily corrected by a mixture either of barley or rice.

TO MAKE HOMMINY CAKE.

By Captain Smith.

32. This is another American dish: it is made of maize freed from the husks, boiled whole along with a small proportion of a large kind of French beans, until it becomes almost a pulp. It is then eaten in that state, or baked over the embers into a kind of cake. It is in general use among all classes of people, and to most tastes is found very agreeable.

TO

TO MAKE MIXED BREAD.

33. Take a peck of the meal of maize, and boil it into a paste, a peck of potatoes boiled, skinned, and mashed, and a like quantity of wheat flour. Let these be kneaded into a dough, with salt and yeast; and, after standing before the fire a sufficient time to prove, divided into loaves and baked.—N. B. A good bread may be made by substituting barley or oatmeal for the wheat flour.

TO MAKE MAIZE BREAD.

34. Take a peck of the meal of maize, mix it up with water, and boil it over the fire till it comes to the consistence of paste; then take a peck of wheat flour, and knead both together, with a proper proportion of salt and yeast, into a dough; allow it to stand before the fire for two hours to ferment, and then divide it into loaves, and put them in the oven.

FIFTHLY,

OF RICE.

35. Rice is a hard grain, with a coarse thick husk, somewhat resembling barley, only whiter, and

and much harder; its grains are fastened to a beard, and its chaff is very rough. The bran adheres not to the grain, as that of oats or wheat, but consists of two lobes, which easily separate and loosen, and are therefore readily cleaned and broke off.

36. It comes principally from China and South Carolina, and is sown * soon after the vernal equinox. It grows best in low marshy land, and should be sown in furrows twelve inches asunder. It requires to be flooded, and thrives best if six inches under water. The water is occasionally drained off, and turned on again, to overflow it three or four times.

37. When ripe, the straw becomes yellow, and it is either reaped with a sickle, or cut down with a scythe and cradle, some time in the month of September, after which it is raked and bound, or got up loose, threshed, and winnowed, in the same manner as wheat or barley.

38. Husking it requires a different and particular operation in a mill made for that purpose. The mill is constructed of two large flat wooden cylinders, formed like small mill-stones, with channels or furrows cut therein, diverging in an oblique direction from the centre to the circumference, made of a heavy and exceeding hard timber, called light wood, which is the knobs of the pitch pine. It is turned with the hand like the common hand-mills, which rubs and cleans off the husk, when it is again winnowed

* Smith's Tour in the United States of America, Vol. II. p. 66.

mowed, and put into bags or casks for exportation.

39. From the tedious and defective manner in which it is cleaned, the Board of Agriculture are of opinion that it may be obtained at a much lower price than it is at present, if the merchants were to import it with the husks on, and have it cleaned in this country; for, from the superiority of our machinery, it might be done at a much less expence than by manual labour.

40. This grain is the chief food of half the world; it nourishes probably more human beings than all the other articles of food taken together. It is peculiarly calculated to diminish the evils of a scanty harvest, an inconvenience which must occasionally affect all countries, particularly those which are opulent and populous. It* is the most fitted of all food to be of use in relieving general distress in a bad season, because it comes from a part of the world where provisions are cheap and abundant; it is light, easy of carriage, keeps well for a long time, and contains a great deal of wholesome food within a very small compass, and is supposed to be the most nutritive of all the sorts of grain. Indeed, it has been ascertained that one gallon of rice contains as much food and useful nourishment as six gallons of wheat.

41. Rice has little sweetness, is not readily ascescent, nor easily subject to fermentation. It has been supposed among physicians to be possessed

* Reports of the Society for bettering the Condition of the Poor, Vol. I. p. 137.

sessed of some drying or astringent quality, and has therefore been commonly employed in diarrhœa and dysentery, in preference to other farinaceous grains. The Board of Agriculture, who have paid a most unremitted and laudable attention to every circumstance relating to the preparation of bread, have not allowed this remark to escape their observation, and in their reports have recommended a mixture of rye flour with the rice, the astringent quality of which, thus mixed with the rye, corrects the laxative quality of the latter, while the aperient nature of the rye prevents any ill effects from the astringency of the rice. Thus a strong, cheap, and nourishing bread, equally good with that made from wheaten flour, is produced.

42. A very childish prejudice has existed with respect to rice, viz. that it is prejudicial to the sight, and the eyes are sometimes affected by its use, but no physical reason has ever been given for this opinion, nor any authority derived from experience. On the contrary, the opinion of the ablest * men may be quoted in favour of its being a very healthy food, and the experience of all Asia, and a great part of Europe, Africa, and America, may be adduced with sufficient weight to have answered the objection, if it had been supported by any thing more than a mere naked and bare assertion.

* Cullen's Mat. Med. Vol. I. p. 239.

TO

TO MAKE BREAD FROM RICE ALONE.

From the Repertory of Arts and Manufactures.

43. The art of making bread from rice, though much spoken of, seems to be very little known. The first thing to be done to the rice is to reduce it to flour, then take as much of it as may be thought necessary, and put it into a kneading trough, in which bread is generally made. At the same time heat some water in a saucepan, and having thrown into it a few handfuls of rice, let them boil together for some time; the quantity of rice must be such as to render the water very thick and glutinous. When this glutinous matter is a little cooled, it must be poured upon the rice flour, and the whole well kneaded together, adding thereto a little salt, and a proper quantity of yeast. The dough is now to be covered with warm cloths, and suffered to stand till it rises. During the fermentation, this paste, which, when kneaded, must have such a proportion of flour as to render it pretty firm, becomes so soft and liquid, that it seems impossible it should be formed into bread. It is now to be treated as follows.

44. When the dough is rising, the oven must be heated; and when it is of a proper degree of heat, take a stew-pan of tin or copper tinned, to which is fixed a handle of sufficient length to reach to the end of the oven. A little

tle water must be put into this stew-pan, and then it is to be filled with the fermented paste, and covered with cabbage leaves or a sheet of paper. When this is done, the stew-pan is to be put into the oven, and pushed forward to the part where it is intended the bread shall be baked; it must then be quickly turned upside down. The heat of the oven acts upon the paste in such a way as to prevent its spreading, and keeps it in the form the stew-pan has given it.

45. In this manner pure rice bread may be made: it comes out of the oven of a fine yellow colour, like pastry which has yolks of eggs in it. It is as agreeable to the taste as to the sight, and may be made use of like wheat bread to eat or put into broth.

TO PREPARE BREAD FROM RICE.

By the Matron of the Foundling Hospital.

46. Boil a quarter of a pound of rice till it is quite soft; then put it on the back part of a sieve to drain, and when it is cold, mix it up with three quarters of a pound of flour, a spoonful of yeast, and a small table spoonful of salt. Let it stand for three hours, then knead it up, and roll it in about a handful of flour, so as to make the outside dry enough to put in the oven. About an hour and a quarter will bake it, and it will produce one pound fourteen ounces of very good white bread, but it should not be cut till it is two days old.

TO

TO MAKE MIXED BREAD.

47. Take half a peck of rice flour and one peck of wheat seconds flour, mix them together and knead the dough up with a sufficient quantity of salt, yeast, and warm water, then divide it into eight loaves and bake it.

TO MAKE MIXED BREAD.

48. Take a peck of rice, boil it, over night, in a copper, till it becomes soft, then put it in a pan, and by the morning it will be found to have swelled prodigiously. A peck of potatoes should now be boiled, skinned, and mashed into a fine pulp, and while hot, be well kneaded up with the rice, and a peck of wheat flour; at sufficient quantity of yeast and salt should now be added, and the dough left in the kneading trough two hours to prove; it is then to be divided into loaves and baked in the usual way.

SIXTHLY.

OF OATS.

49. This is a farinaceous grain, used by many people in the Northern parts of Europe; but is especially the food of the people of Scotland,

land, and was formerly that of the Northern parts of England: countries which have always produced as healthy and as vigorous a race of men as any in Europe.

50. The meal of oats discovers but little sweetness, and it is destitute of the glutinous principle which is contained in wheat: hence it is necessary to supply these deficiencies, when it is made into bread, which may be done with milk, or a decoction of any animal substance, otherwise it will crumble to pieces when baked.

51. Dr. R. Pearson, in his communication to the Board of Agriculture, is of opinion, that oats made into bread, as a substitute for wheat, are preferable to either barley or rye; for barley meal gives a heavy, viscid, and flatulent bread; and bread that contains a large proportion of rye flour, readily becomes acescent, and, consequently, is very unfit for children, and frequently disagrees with grown-up persons: whereas, the wholesome properties of oatmeal, and its fitness, as an aliment, for man, both in the infant and adult state, have been ascertained by the experience of ages. In addition to the objection that may be thrown out against barley or rye, it may be mentioned, that they are considerably dearer than oats; which, when a cheap provision for the poor is required, is a matter of no small moment. Under every point of view, therefore, oats seem preferable to the other species of grain, as a general substitute for wheat.

52. The soil best adapted to oats, is a rich, sandy

sandy loam; but they will succeed upon almost any land. Their cultivation is similar to that of barley; the ground being generally broken up by a winter fallow of three or four plowings. Oats are, however, sometimes sown on one plowing. The seed process is frequently the same, except that oats are more commonly sown above furrow than barley is. The time of sowing is generally the latter end of March and the beginning of April, and the quantity about four bushels an acre: it is usual to hand-weed them, and the harvest process is, in every respect, similar to that of barley.

TO MAKE OAT BREAD.

53. Take a peck of oatmeal and an ounce of salt, knead them up into a stiff paste with warm water, roll it out into thin cakes, and bake them in an oven, or over the embers.

54. This kind of bread is much used in Scotland, among the lower order of people, who, from long custom, prefer it to the best wheaten bread. In some cottages it undergoes the acetous fermentation, and is thereby rendered lighter and more easy of digestion; but the generality of the people merely soften their oatmeal with water, and bake it over the fire. These cakes have a bitter, dry taste, which, though disagreeable at first, comes in time to wear off, when they are found to be a pleasant, grateful food.

TO MAKE MIXED BREAD.

By Dr. R. Pierson.

55. Take a peck of oatmeal, the same quantity of seconds flour, and half a peck of boiled potatoes, skinned and mashed; let them be kneaded up into a dough, with a proper quantity of yeast, salt, and warm milk; it should then be made up into loaves, and put into the oven, where they are to remain for three hours.

56. The bread, thus prepared, rises well in the oven, is of a light brown colour, and by no means unpleasant flavour; tasting so little of the oatmeal as to be taken, by those who are unacquainted with its composition, for barley or rye bread. It is sufficiently moist, and, if put in a proper place, keeps well for a week. Bread made in this way is about eight-pence halfpenny a peck cheaper than wheaten bread; which, in large families, will, at the year's end, amount to a very considerable saving, if it was substituted for it.

TO MAKE MIXED BREAD.

57. Take one peck of oatmeal and the same quantity of rice-flour, let these be kneaded up with a sufficient quantity of warm milk, yeast, and salt, and after standing a proper time to prove,

prove, will be found a very palateable, wholesome, and nourishing bread.

SEVENTHLY.

OF BEANS.

58. Beans, when dry and husked, are readily broke down into a fine flour of the same nature and properties as the meal of other grain; they have a sweeter taste, and afford, by proper treatment, a starch * equal to that of wheat; they likewise contain a small proportion of oil, which renders their flour very nutritive, and occasions it to be admirably adapted to the stomachs of laborious, robust husbandmen. The flavour of bean flour is harsh and disagreeable; but if steeped in water before it is used, this unpleasant taste will then be hardly perceived.

59. Beans are universally the object of the farmer's culture, and invariably succeed † either wheat or barley. They grow best upon a strong, stiff soil; which is plowed as soon after Christmas as the season will permit, in order to take the frost. It is afterwards harrowed, to reduce the surface to powder. About candlemas the setting begins: the beans are planted by women, sometimes with and sometimes without a line; but those who have been long

* Cullen's Mat. Med. vol. i. p. 240.
† Marshall's Rural Œcon. of Glocester. vol. i. p. 141.

in the habit of setting without one, are able to go on pretty regularly with the eye alone; and the young ones are trained up by putting one of them between two who are experienced. Each setter is furnished with a setting pin and a bag, hung round the waist, to carry the beans in; one is then dropped into each hole, and each bean is set two inches apart: the distance between the rows varies from ten to fourteen inches. After they are planted, a tine harrow is drawn over the field for the purpose of covering the seed. As soon as the beans are a hand high they should be hoed, which operation should be again repeated before the beans begin to blow. In this last hoeing the rows are to be carefully hand-weeded; not a weed should be left standing, because beans cannot blow among weeds, as they throw out the blossom from the sides of their stems down to within a few inches of the ground, and if they are then invaded with weeds, the pods will not come to perfection. In some places it is the practice to top them at this time, in others not; the necessity may be judged of by their manner of growing: if they are stout and short, topping is unnecessary; but if they are disposed to draw up each other tall and weak, then it ought to be done, otherwise the crop will be found in the rick yard instead of the granary. Beans, unless very short, are usually reaped and bound up into sheaves, which remain on the ground till perfectly cured, when they are conveyed to the rick yard and stacked.

TO

TO MAKE BEAN BREAD.

60. Take a quarter of a peck of bean flour and a little salt, mix them up into a thick batter with water, then pour a sufficient quantity to make a cake into an iron kettle and bake it over the fire, taking care to turn it frequently lest it should burn.

61. A bread similar to this was in daily use among many of the inferior orders of people in this town, during the time wheaten bread was so excessively dear; who were known to subsist, for weeks together, upon this flour alone, made into a batter with water, and fried over the fire in a pan, with the dirty scrapings of a butter firkin; and, unless relieved by the hand of charity, they had no other nourishment whatever, except tea, if that can be considered as such.

TO MAKE MIXED BREAD.

From the Reports of the Board of Agriculture.

62. Send a bushel of good, dry beans to the mill, let the husks be taken off, and then grind the meal into a fine flour, which, if good, will produce a full bushel of this flour. Let a peck be soaked for three days in a pan of water, changing the water every day to take off its disagreeable flavour; then pour the water clear off, and put the meal into a sieve to drain: while this is drying, put a peck of wheat flour

in the kneading trough, and mix it up with some salt and yeast. After it has properly fermented, knead the bean flour along with it into a dough, and after it has stood a sufficient time to prove, let it be divided into loaves and baked. This bread will be found not only very nourishing, but, at the same time, sufficiently palateable for household use.

EIGHTHLY.

OF PEAS.

63. After what has been said of beans, very little will be requisite to say on this head, as their nature and cultivation are so nearly alike. Peas are usually either drilled or dibbled, in rows, about the beginning of March, on wheat or barley stubbles that have been plowed and harrowed; they are afterwards twice hoed, giving the soil, if sufficiently free from root-weeds, a most beautiful, garden-like appearance, in the former part of the summer, and which, at harvest, if the season prove favourable, seldom fails of affording the cultivator a more substantial gratification.

TO MAKE PEA BREAD.

64. Take a peck of the flour of peas, the like quantity of oatmeal, and two ounces of salt; knead them up into a stiff paste with warm water,

water; let it be rolled out into thin cakes, and baked over the embers, or it may be made up into flattish rolls, and baked in an iron pot, hung over a wood fire.

65. This kind of bread is in very common use in some parts of Scotland, where it is considered as a good substantial nourishment, for labourers in husbandry, who often prefer it to wheaten bread.

TO MAKE MIXED BREAD.

66. Take four pounds of pea flour, steep it in water, as directed for the flour of beans, then knead it up with four pounds of potatoe flour, and double that quantity of seconds wheat flour, which has been previously fermented with yeast, and a proper quantity of salt, and let the dough stand to rise, when it must be divided into loaves and baked.

NINTHLY.

OF POTATOES.

67. The potatoe is a plant that belongs to the pentandrious class in Linnæus's system of vegetables, and ranks under the order monogynia. Notwithstanding the root of it is in general use, as a nourishing food for man; yet this was not always the case, for, on its first introduction, doubts were suggested respecting the

propriety of its use, on account of its relationship to the nightshade, and other poisonous plants; but now its nutritious* qualities are fully ascertained, by the experience of all Europe, and in almost every part of this kingdom, it makes a considerable portion of the food of the poor; and in Ireland, in particular, millions of people exist, whom, from sufficient evidence, we are pretty certain, live for years together on this root and water, without any other seasoning than a little salt.

68. We owe their discovery† to Admiral Drake, who observed them in his first voyage, in 1578, in the islands to the westward of the Straights of Magellan, and brought them home with him; but for near a century they were only cultivated in Ireland, and it is not more than seventy or eighty years since they have found a place in the kitchen gardens of this country, and their general introduction to field culture is one of the modern improvements that reflects the greatest honour on the genius and industry of the present age.

69. Potatoes are so generally known as to require no description, but a few reflections respecting their cultivation may, in this place, be brought forward with propriety. The first written description of their use and culture, was in the Philosophical Transactions in the year 1671, in consequence of a dearth that had taken place in Ireland the year before, and they

* Cullen's Mat. Med. vol. 1. p. 237.

† Tissot on Bread Corn, and Bread, p. 35.

they were recommended to the inhabitants of this country, as a succedaneum, in case the crops of grain, from any unforeseen occurrence, should ever miscarry here. They will grow and thrive upon almost any land, but if planted on wet soils, they generally prove bad, are always waxy, and sometimes have a disagreeable flavour, but those on a rich, deep, sandy loam grow to a large size, have a pleasant taste, and, when properly boiled, drop into a soft smooth meal.

70. Potatoes are propagated in two ways, first by seed, and secondly by planting the eyes or cuttings. The advantage of preserving and sowing the seed is, that by this means, new kinds are frequently introduced, some of which, as the kidney potatoe, prove more valuable than any yet raised: besides, the farmer has it in his power to preserve, for his own use, the finest sorts, or those best adapted to his soil; and it also is one grand means of preventing this valuable root from degenerating or decreasing in its produce, which it unavoidably does after a long series of cultivation.

71. The method of raising it by seed* is as follows: let a quantity of the potatoe apples be gathered in October, and hang them up in a warm room till Christmas, then rub out the seeds and spread and dry them on paper, and preserve them from damps till the spring. In March they are sown in fine garden mould, and as fast as the plants get into rough leaf, and are

* Bath Society Papers, vol. 1. p. 140.

strong enough to be handled without injury, they are transplanted from the seed bed into another bed of fresh rich mould in rows, care being taken to keep them clean during the summer. In autumn, bunches of small potatoes are found at the roots of these plants, varying in size, from a hazel nut to a crab. These being planted next spring, produce potatoes of the middle size, but they do not arrive at their fullest bulk until the third or fourth year.

72. In Yorkshire*, where the propagation of potatoes has arrived at as great perfection as in any district in the kingdom, the common practice is to cultivate them as a fallow crop for wheat, on the cleanest part of a stubble, or on other ground intended to be summer fallowed for wheat. The soil is broke up in winter or spring, and worked over two or three times with the plough and harrow, in order to get it as fine as the nature of an early spring fallow will admit of. Twenty or thirty cart loads of horse dung are then laid on every acre, and left in heaps. The potatoes are then cut into sets, with eight or ten eyes to each. The sets being prepared, the seed plowing is given. In this plowing, the land is laid up in ridgelets, similar to those in which gardeners leave the soil in the operation called trenching, when it is not intended to be immediately cropped: the width of these ridgelets depends on the judgment of the planter; from two and a-half to three feet is

* Marshall's Rural Œcon. of Yorkshire, vol. 2. p. 57.

is the usual width, and the bottom of the drills should be left straight, narrow, and clean. In these drills the sets are dropped by women or boys, at twelve or eighteen inches distance. While one party are planting, another are carrying on the dung in baskets, scattering it regularly along the drills, covering each set with its due portion of manure. The plough closes the business of planting, by returning the ridges upon the plants and dung. As soon as the young plants make their appearance, the land is harrowed lengthways of the ridges to tear up the seed weeds which grow upon their crowns, and to smother those in the trenches with the mould. In a short time after, the plough, with the share broad and sharp, is run through each interval, and the rows cleaned with the hoe. In a few weeks more they should be hoed again, and when, from the size of the plants, that is inadmissible, hand weeding is, or ought to be, made use of. At Michaelmas they are taken up with common dung-forks, freed from the mould, and preserved either in pits within the ground, or laid in long ridges along the surface, covered up from the wet and frosts with bean straw, and a coating of the surrounding soil.

73. The public have lately been favoured with an exact analysis of this useful root by one of the most able and distinguished physicians of the present day, and to whom the faculty are indebted for the accurate and beautiful analysis of James's powder. This gentleman, at the request of the Board of Agriculture, instituted a great variety of experiments to ascertain the compo-

composition of a potatoe, and he considers it as a mechanical mixture, consisting of water, starch, leafy or fibrous matter, and extract or soluble mucilage, separable from one another by mechanical means: the following is the result of these experiments.

74. A quantity of potatoe* roots were rasped, and, in this state, they resembled curdy matter in a watery liquid; of these rasped potatoes, 7000 grains were mixed with four pints of river water. After being macerated four and twenty hours, during which time the mixture was frequently stirred, a clear dark brown liquid of the smell of the potatoe, possessing neither acid nor alkaline properties, was poured off, leaving behind a large proportion of leafy or fibrous substance, and a precipitate of a white impalpable powder. This white precipitate and fibrous substance were macerated repeatedly with fresh portions of water, till the decanted liquor was colourless, and without smell or taste. The fibrous substance and white precipitate being mixed with water, were poured upon a fine hair sieve, through which the water passed, carrying with it the white precipitate, the fibrous matter being left behind. The white sediment deposited from the filtrated water, on standing, being collected and dried, weighed 1050 grains; it had the obvious or sensible properties of starch of wheat, and afforded a transparent jelly with boiling water. The leafy and fibrous

* Experiments and Observations on the Constituent Parts of the Potatoe Root, p. 6.

fibrous substance being dried, formed small, hard, brittle, irregular-figured masses, which amounted, in weight, to 600 grains. A pint of the first filtered brown liquid, poured from the leafy substance and white precipitate, being evaporated, an extract was obtained, which had a strong smell of potatoes and empyreuma. It had a slight saltish taste, but to the test of turnsol and turmeric, betrayed no acid or alkaline properties. The whole extract or soluble mucilage, in 7000 grains of potatoe root, by estimation, was from 350 to 400 grains; of course, the quantity of water in this quantity of potatoe root, was about 5000 grains. A little of the dried leafy substance, and also a little of the extract emitted while burning the smell of farinaceous substances, and not at all that of animal matter in general, or of glue of wheat in particular; besides these articles, potatoes also contain potash or vegetable alkali, and a volatile essential oil, and in its juice or water there is an acid that disappears on burning to ashes.

75. It therefore appears from the above experiment, that one hundred grains of potatoe root, deprived of its skin, contains:

Of water from - -	68 to 72 parts
Of meal from - -	32 to 28
	100 100

And

And this meal consists of three different substances.

1st. Of the starch or fæcula, from - - -	17 to 15 parts.
2d. Of leafy or fibrous matter, from - - -	9 to 8.
3d. Of extract or soluble mucilage, from - -	6 to 5
	32 to 28.

76. The composition, or, more properly speaking, the mixture of the potatoe root, is, in many respects, similar to that of the seed of wheat; the principal and essential difference between the meal of wheat and potatoes is, that the former contains a glutinous animal substance, and the latter, in place of it, a leafy or fibrous vegetable matter; but the principal ingredient, in point of quality, in both kinds of meal, is starch, and they equally afford an extract or contain a soluble mucilage.

77. The art of fermenting potatoe meal into bread, in place of wheat, has not yet been discovered, nor is it reasonable to suppose that it will, on account of the difference that exists between the glutinous substance of wheat and the leafy or fibrous matter of potatoes; the first is tenacious, and causes the starch to bind readily into a dough when mixed with water, but the latter, having no adhesive property, when mixed

mixed with water, runs into an opaque mass: thus one, by the union of yeast, ferments and rises into a light porous dough, while the other remains a heavy indigestible mass. It therefore appears, that potatoes alone cannot be made into bread, but they seem to have an admirable effect in making any species of bread, naturally harsh and heavy, both light and pleasant.

78. From what has been advanced on this subject, it will easily be perceived, that the meal of potatoes, when reduced into a flour, and baked into a bread, or merely boiled or roasted, which is the simplest and cheapest way of preparing them, is as salutary and as capable of nourishing mankind, as the flour of wheat, or any other grain.

ON THE REDUCTION OF POTATOES TO FLOUR.

79. Put a bushel of kidney potatoes into a large tub, and clean off the dirt with a birch broom and water; afterwards scrub them clean with a brush, and let them be rasped into a pulp on a bread grater into a hair sieve, that is placed over a broad deep pan. Let some water be poured, occasionally, by one person, over the pulp, while another stirs it with his hand: the water, in its passage, carries the starch along with it, which is deposited at the bottom of the pan. After standing a night, the water is poured off, and the starch remaining behind is taken out and put into conical baskets, like those

those used for salt, covered with cap paper, and hung in a stove to dry by a gentle heat. It is then ground in a hand-mill, and passed through a fine lawn sieve, when it will have the exact appearance of starch, be of a beautiful white* colour, and is then ready for making into bread. A bushel of potatoes that weighs sixty pounds, if they are mealy, ought to produce, in this way, eight pounds of flour at least; and suppose an acre of good land, well managed, would yield three hundred bushels, near a ton and a quarter of this flour might be produced from it.

TO PREPARE POTATOES TO EAT AS BREAD.

From the Reports of the Board of Agriculture.

80. There is nothing that would tend more to promote the consumption of potatoes than to have the proper method of preparing them as food generally known. In London this is little attended to, whereas, in Lancashire and in Ireland, the boiling of potatoes is brought to very great perfection indeed. When prepared in the following manner, if the quality of the root is good, they may be eat as bread, a practice not unusual in Ireland.

81. The

* This powder, with the addition of a small quantity of gum tragacanth in powder, is in universal request, as a light nourishing food for invalids, and is sold in the shops for six shillings a pound, under the name of Indian arrow root.

81. The potatoes should be as much as possible of the same size, and the large and small ones boiled separately, they must be washed clean, and, without paring or scraping, put in a pot with cold water, not sufficient to cover them, as they will produce, themselves, before they boil, a considerable quantity of fluid. They do not admit being put into a vessel of boiling water, like greens, and whenever they are boiled, should be taken out of the water and kept dry. If the potatoes are tolerably large, it will be necessary, as soon as they begin to boil, to throw in some cold water, and occasionally to repeat it till the potatoes are boiled to the heart (which will take from half an hour to an hour and a quarter, according to their size) they will otherwise crack and burst to pieces on the outside, whilst the inside will be nearly in a crude state, and consequently very unpalateable and unwholesome. During the boiling, throwing in a little salt occasionally, is found a great improvement, and it is certain, the slower they are cooked the better they eat. When boiled, pour off the water, and evaporate the remainder, by replacing the vessel in which they were boiled, once more over the fire; this makes them remarkably dry and mealy, more especially if they are kept for some time after in a potatoe roaster, a most excellent and useful machine, which may be had at Lonsdale's, in Taylor-street, Carnaby Market. They should be brought to table with their skins on, and eat with a little salt as bread: nothing but experience can satisfy any one, how

how superior the potatoe is thus prepared, to the common method of paring and boiling it.

82. Steaming potatoes will never answer, as the immersion in water causes them to discharge a certain substance, which the steam, alone, is incapable of doing, and, by retaining of which, the flavour of the root is injured.

TO MAKE POTATOE BREAD.

83. Pare one peck of potatoes, put them into a proper quantity of water, and boil them till they are reduced to a pulp, then beat them up fine in the water they boiled in, and knead them with two pecks of wheat flour, with a sufficient quantity of yeast and salt, into a dough; cover it up, and allow it to ferment for two hours or upwards, according to the state of the weather; then make it up into loaves and bake them.

TO MAKE POTATOE BREAD.

84. Choose the most mealy sort of potatoes, boil and skin them, take twelve pounds, break and strain them through a very coarse sieve of hair, or a very fine one of wire, in such a manner as to reduce the roots, as nearly as possible, to a state of flour. Mix it up well with twenty pounds of wheaten flour; of this mixture make and set the dough exactly in the same manner as if the whole were wheaten. This quantity will

will make nine loaves of about five pounds each in the dough, and when baked about two hours, will produce forty-two pounds of excellent bread.

TO MAKE POTATOE BREAD.

By P. Colquhoun, Esq.

85. Take three pounds of potatoes, put them into a skillet with cold water, hang it a distance over the fire, so that they may not boil; then skin and mash them, and whilst warm, bruise them with a spoon or a clean hand, put them into a dish or a dripping pan before the fire, to let the moisture evaporate, stirring them frequently, that no part may grow hard; when dry, take them up and rub them as fine as possible between the hands, then add nine pounds of wheaten flour, and with a sufficient quantity of yeast and salt, knead it up as other dough; lay it a little while before the fire to prove, and then divide it into loaves and bake them in a very hot oven.

TENTHLY.

MISCELLANEOUS SUBSTITUTES FOR BREAD.

86. Other articles besides these already enumerated, have, in different ages of the world, and in different countries, been in request as substitutes

sub titutes for bread, and millions of people, at this time, in different parts of the globe, neither sow nor reap; but content themselves with enjoying the spontaneous productions of the earth. Among the most valuable of this class of vegetables, stands the bread fruit tree *, which requires no cultivation, nor costs any labour or trouble to procure. It grows in the South Sea Islands, and is the produce of a large tree, about the size of a middling oak. It hath a spreading head, is full of branches and dark green leaves: the fruit grows on the boughs, like apples, of the size of a child's head, and with a thick, tough rind. It is gathered, when full grown, while it is green and hard; it is then roasted in the embers, or baked in an oven, which scorches the rind and turns it black; this is rasped off, and there remains a tender, thin crust; while the inside is soft, tender, and white, like the crumb of a penny loaf. It must be eaten new, for if it is kept above four-and-twenty hours, it grows harsh and disagreeable. It lasts in season eight † months in the year; during which time the natives eat no other sort of food of the bread kind, and the deficiency of the other four months is made up with cocoa nuts, bananas, and

* Dampier's Voyages, vol. 1. p. 296.

† This invaluable tree was, a few years ago, by the express desire of his Majesty, introduced into the West India Islands, by a naval officer; whose sufferings and perseverance are recorded in an elegant and interesting narrative, which does honour to his feelings, both as a man and a gentleman.

and plantains; these latter, when roasted *, are a very good substitute for bread, and are, without exception, preferred to it by the negroes, and most of the native whites, in the West India Islands. Boiled yams, seasoned with Cayenne pepper, are, likewise, in daily use for the same purpose; and, in the East, whole nations subsist entirely upon fruits and rice; which last is boiled soft, with the addition of milk, and thrown into a sieve or cullendar, and a stream of cold water being suffered to pass through, gives it a peculiar and agreeable crispness. Dates, and dried figs, are another excellent vegetable food; and their nutritious qualities are well ascertained by the experience of thousands of people in the Southern parts of Europe, who live upon them entirely, rather than rise from the couch of indolence to cultivate a soil, rich beyond comparison: while the laborious Laplander †, in the North, who lives under a rigorous sky, and upon an ungrateful and barren soil, can procure no other nourishment than bread composed of the coarsest meal, mixed with the bark of trees, which he eats with gruel, seasoned only with salt, or with fresh or dried fish. An Englishman placed under such circumstances, would soon cease to exist; but these people are attached to their manners and customs, which they transmit unchanged from generation to generation; and if they emigrate to

* Edwards's History of the West Indies, vol. 1. p. 419.
† Cotteau's View of Sweden, p. 335.

to more opulent provinces, they observe, while absent, the strictest œconomy in their manner of living, and endeavour to save enough to enable them to return to their native wilds again.

87. In times of great scarcity there are other substances, which, though not in common use, would, most probably, afford a wholesome nourishment, either by boiling or separating their starch from them; as white briony, the orchis, and Indian arrow root. Sago, and even gum Arabic, diluted with water, has been known to subsist travellers for many days, while passing the Deserts of Arabia; and acorns, chesnuts, and cassava, have, from time immemorial, been considered as a suitable nourishment for man.

TO MAKE ACORN BREAD.

88. Take a quantity of acorns, fully ripe, deprive them of their covers and beat them into a paste, let them lay in water for a night, and then press it from them, which deprives the acorns entirely of their astringency. Then dry and powder the mass for use. When wanted, knead it up into a dough, with water, and roll it out into thin cakes, which are to be baked over the embers.

89. Bread made after this method is by no means disagreeable, and was much used in former times; and even to this day, it is said to be made use of in some countries.

TO MAKE CHESNUT BREAD.

By M. Parmentier.

90. Take a peck of horse chesnuts, peel the skins off them, let them be bruised into a paste, dilute the mass with water, which destroys their astringency, and strain them through a sieve; a milky liquor is thus separated, which, on standing, deposits a fine white powder; this, on being dried and ground into flour, is found to be without smell or flavour. It is then made up, sometimes by itself, and not unfrequently with an equal portion of wheat flour, into a paste, with warm milk and a little salt, and, when baked, makes a very good and palateable bread. Its nutritious qualities are well known to the people in the Southern parts of Europe, particularly in Lombardy and Corsica, amongst many of whom it is often the chief and almost the whole of their food.

TO MAKE TURNIP BREAD.

By J. Sands, Esq.

91. At the time I tried this method, bread was very dear; insomuch, that the poor people in the country, where I live, could hardly afford themselves half a meal a-day. This put me upon considering whether some cheaper method might not be found than making of

wheat bread. Turnips were, at that time, very plentiful. I, therefore, had a number of them pulled, washed clean, pared, and boiled: when they became soft enough to mash, I had the greatest part of the water pressed out, and afterwards had them mixed with an equal quantity, in weight, of coarse wheat meal; the dough was then made, in the usual way, with yeast, salt, and water. It rose very well in the trough, and after being well kneaded, was formed into loaves, and put into the oven to be baked. I had, at the same time, some other bread made in the ordinary way; but I baked my turnip bread rather longer than the other.

92. When they were drawn from the oven, I caused a loaf of each sort to be cut, and found, on examination, that the turnip bread was sweeter than the other, to the full as light and white, but had a little taste of the turnip. Twelve hours afterwards I examined it again; when I found the taste of the turnip in it scarcely perceivable, and the smell quite gone off. On examining it again, twenty-four hours after it had been baked, I should not have known that there were turnips in its composition, had I not seen them put in, and, as far as I could see, it kept as well as the bread made of the common wheat meal.

TO MAKE CASSAVA BREAD.

93. The native Americans make a very mild nourishing bread from the root of a very acrid plant

plant called Manise. They first strip the root, rasp it, and put it into a sack of rushes, made in the form of a cone, and of a very open texture, which they suspend to a staff placed across two upright posts. At the lower extremity of this sack, they hang a heavy vessel, which, by its weight, presses the root, and receives the juice which flows out, and is a most acrid and dangerous poison. When the fœcula is well pressed, and deprived of its juice, it is dried in the smoke, sifted, and then forms cassava. This farina is afterwards moistened with water and spread on a hot plate of iron, and turned till both its surfaces acquire a reddish yellow colour, which denotes that it is sufficiently baked. In this state it is called cassava bread, and is by no means an unpleasant food.

CHAP. VIII.

ON THE PREPARATION AND PRESERVATION OF YEAST.

TO PRESERVE YEAST.

SECT. I.

WHEN yeast is plentiful, take a quantity, and work it well with a whisk until it becomes thin; then procure a large wooden dish or platter, clean and dry, and with a soft brush lay a thin layer of yeast on the dish, and turn the top downwards to keep out the dust, but not the air which is to dry it. When the first coat is dry, lay on another, and let that dry, and so continue till the quantity is sufficient; by this means, it may soon be made two or three inches thick, when it may be preserved in dry tin cannisters, for a long time, good. When you use it for baking, cut a piece off and lay it in warm water, and dissolve it, when it will be fit for use.

TO MAKE YEAST FROM POTATOES,

By John Kirby, Esq.

2. Boil potatoes of the mealy sort, till they are thoroughly soft, skin and mash them very smooth, and put as much hot water on them as will make a mash of the consistency of common beer

beer yeast, but not thicker. Add to every pound of potatoes, two ounces of treacle, and when just warm, stir in for every pound of potatoes, two large spoonfuls of yeast. Keep it warm till it has done fermenting, and in twenty-four hours it will be fit for use. A pound of potatoes will make near a quart of yeast, and when made, it will keep three months. This yeast has been found to answer the purpose so well, as not to be able to distinguish the bread made with it, from brewer's yeast.

TO MAKE YEAST,

By Dr. Lettsom.

3. Thicken two quarts of water with four ounces of fine flour, boil it for half an hour, then sweeten it with three ounces of brown sugar; when almost cold, pour it along with four spoonfuls of baker's yeast into an earthen jug, deep enough for the fermentation to go on without running over; place it for a day, near the fire, then pour off the thin liquor from the top, shake the remainder, and close it up for use, first straining it through a sieve. To preserve it sweet, set it in a cool cellar, or hang it some depth in a well. Keep always some of this to make the next quantity that is wanted.

TO MAKE YEAST.

By Mr. Henry.

4. Take two ounces of flour, boil it over the fire in a quart of water, till it comes to the consistence

sistence of a thin jelly, and pour it into the middle part of Dr. Nooth's machine for impregnating water with fixed air; then put into the lower vessel some coarse powdered marble, and pour on it some sulphuric acid, diluted with water. The apparatus is now to be adjusted, and the upper vessel put in its place, and nearly stopped. The fixed air being now extricated, passes through the valve, and ascends into the middle and upper part of the machine, where the gas is absorbed by the flour jelly in considerable quantity; and, in the course of a few hours, the matter will be found so strongly impregnated, as to be in a state of fermentation. This artificial yeast may now be removed from the machine, and put into a bottle for use. We are indebted to the learned and ingenious Mr. Henry, of Manchester, for this valuable method of preparing yeast, which may be made with facility in situations where it is impossible to procure brewer's yeast. When made in this way, and mixed up with the dough, Mr. Henry found it to answer the purpose nearly as well as brewer's yeast. To those who wish to have a constant supply of yeast, one experiment of this kind will be sufficient, as the process may be afterwards shortened by mixing some of this fluid with the foregoing preparation, which it will set a fermenting the same as if brewer's yeast was used.

TO MAKE YEAST.

5. Take half a pound of fine flour, the same quantity of coarse brown sugar, and a quarter of

of a peck of bruised malt; boil these over the fire for a quarter of an hour, in half a gallon of water, then strain the liquor through a sieve into an upright jug, and when cooled to 80 degrees of heat, add one pint bottle of the artificial Seltzer water, prepared by Mr. Schweppe, and, if good, it will soon begin to ferment; it should then be set before the fire, and when the ebullition ceases, the yeast will sink to the bottom, and the clear liquor is to be poured off when it will be fit for use. In this way, yeast may be made from water, impregnated with fixed air, from the waters of Gonesse, near Paris, from the Pyrmont waters at Spa, in Germany, the waters of Saratoga, in the province of New York, in America; and, indeed, from any fluid that is strongly impregnated with fixed air.

TO MAKE YEAST,

AS PRACTISED BY THE BAKERS AT EDINBURGH.

By the Hon. Capt. Cochrane.

6. Take two ounces of hops, boil them for an hour in two gallons of water, and while boiling hot, scald ten pounds of flour, and stir it very well into a paste; do this about eleven o'clock in the forenoon, let it stand till six o'clock in the evening, then add about a quart of yeast to forward the fermentation, and mix them well together. Next morning, add as much more flour, and water sufficient to make it into a dough, and in the afternoon it will be

fit for setting sponge and baking. Reserve, always, a piece of the old dough to mix with the new batch instead of the yeast, which is necessary only the first time to hasten the process. The above quantity will suffice for a hundred and twenty quartern loaves. This process, in Scotland, requires about thirty hours, but, in a warm climate, a few hours would suffice, as fermentation there advances with great rapidity; a due attention must be paid to that circumstance, as every thing depends upon it.

THE METHOD OF MAKING YEAST,

As practised by Mr. Gillispie, a Baker, at Leith, who uses it in preference to Distiller's Yeast.

7. In the first place you must have a boiler, cooler, vats, and all the apparatus that would be necessary for a small brewery. Then take four bushels of the best malt, ground as for beer, and mash it in the same manner the brewers do, with sixty-two gallons of water, at the temperature of 180°; let it be close covered up for two hours, then draw the liquor clear off, and pour on the same quantity of water upon the grains a second time, at nearly the boiling point; let this stand an hour, then draw it off, and mix it in your coolers with the first wort; and when it is about blood warm, add four English quarts of yeast to produce the fermentation, and after it has began to ferment the first time (the froth running over into a receiver for the purpose) throw it back again, and when it has

has fermented again, throw it back a second time; and it will then, after the third fermentation, be fit for use, as will be perceived by its being of the thickness that good yeast ought to be. Four bushels of malt, made in this way, produces about twenty-four quarts of yeast; it is an expensive and troublesome way of procuring it, but Mr. Gillispie finds that a quart of it will go as far as a gallon of distiller's yeast. He, at first, in order to lessen the expense, endeavoured to make the refuse liquor into beer, but he found it was so much impoverished, as not to answer the purpose, but it is not entirely wasted, as he disposes of it to the vinegar makers, who give him a trifle for it, which may, perhaps, pay the expense of fuel and labour.

CHAP. IX.

ON THE STRUCTURE OF A BAKEHOUSE.

SECT. I.

A BAKEHOUSE is a manufactory where bread is made for the purposes of sale. In order to render it convenient, it should be attached to the dwelling house, and have an inner door opening into the kitchen, and likewise an outer door to open into a small yard. In this yard there ought to be a well or pump, as also a shed for the piling of faggots. The room should be large and commodious, and the floor laid with stone or tiles. On one side should be erected a dresser or counter, with suitable shelves above it; on another side a kneading trough, about seven feet long, three feet high, two feet and a half broad at top, and sixteen inches at bottom, with a sluice board to pen the dough up at one end, and a lid to shut down like that of a box. On the third side a copper that will contain from three to four pails of water should be erected, which is far preferable to the filthy custom of heating the water in the oven; and on the fourth side the oven should be placed. A bakehouse built upon this plan will, perhaps, be as commodious as art can render it; but, of late years, an alteration has been made in the manner of fitting up the

the oven and copper, that both may be heated with the same fire.

2. In order to comprehend the usefulness of this improvement, it will be necessary to state that an oven, built upon the old principle, is usually of an oval shape; the sides and bottom of brick, tiles, and lime, and arched over at top with a door in front; and, at the upper part, an enclosed closet with an iron grating, for the tins to stand on, called the proving oven. To heat these ovens the faggots are introduced and burnt to an ash; it is then removed, and the bottom cleaned out. This takes up a considerable space of time, during which period a great deal of heat escapes. A still farther length of time is necessary for putting in the bread, and unless much more fuel is expended than is really necessary, in heating an oven upon this principle, it gets chilled before the loaves are all set in, and the bread is, therefore, liable to fall; a circumstance that unavoidably renders it heavy.

3. To remedy this inconvenience, many intelligent bakers have, within these few years past, had their ovens built upon a solid base of brick and lime, with a door of iron furnished with a damper to carry off the steam as it rises. On one side of it is placed a fire-place with a grating, ash-hole, and iron door, similar to that under a copper, with a partition to separate it from the oven, and open at the end. Over this is erected a middling-sized copper with a cock at the bottom, and on one side of it is

placed the proving oven; the whole being faced with brick and plaister.

4. When this oven is required to be heated, the copper is filled with water, and the fire being kindled with coals, the flame runs round the oven, in a circular direction, and renders it as hot as if heated with wood, without occasioning the least dirt or ill smell; and the smoke escapes through an aperture, which passes into the kitchen chimney. When the coal is burnt to a cinder, there is no necessity to remove it, as it prevents the oven from cooling while the bread is setting in, and keeps up a regular heat till the door is closed. The advantages of an oven built upon this construction, are so considerable, independant of the great saving in fuel, that when its principles come to be generally known among bakers, there is no doubt but that they will prefer it to those heated with wood.

5. In great bakehouses, where rolls and French bread are wanted every half-hour, from eight o'clock in the morning till eleven, the perpetual oven *, invented by Count Rumford, will be found particularly useful; more especially if they are called upon to bake meat, puddings, and pies, at different hours in the afternoon. At present, after they are done, they are obliged to keep them warm in the proving oven; but the crust always becomes heavy, and the meat soddened: but in one of these

* Count Rumford's Experimental Essays, vol. 2. p. 172.

these perpetual ovens, they might have such things baked, at the time their customers required them, without putting themselves to any material inconvenience, and, besides, there would be this farther advantage attending the baking, that the effluvia arising from different sorts of meat would never be mixed, and occasion an ill taste, as it now does in the great ovens.—The following is the description given of it by the Count, with the manner of using it.

6. In the centre of a circular, or, rather, a cylindrical mass of brick-work, about eight feet in diameter, which occupies the middle of a large room on the ground floor, I constructed a small, circular, closed fire place, for burning either wood, coals, turf, or peat. The diameter of the fire place is about eleven inches; the grate being placed about ten inches above the floor, and the top of the fire place is contracted to about four inches. Immediately above this narrow throat six separate canals (each furnished with a damper, by means of which its opening can be contracted more or less, or entirely closed,) go off horizontally, by which the flame is conducted into six separate sets of flues, under six large plates of cast iron, which formed the bottom of six ovens on the same level, and joining each other by their sides, which are concealed in the cylindrical mass of brick-work. Each of these plates of cast iron, being in the form of an equilateral triangle, they all unite in the centre of the cylindrical mass of brickwork; consequently the two sides of each unite in a point at the bottom of it, forming

forming an angle of sixty degrees. The flame, after circulating under the bottoms of these ovens, rises up in two canals, concealed in the front wall of each oven, and situated on the right and left of its mouth; and after circulating again in similar flues, on the upper flat surface of another triangular plate of cast iron, which forms the top of the oven, goes off upwards, by a canal furnished with a damper, into a hollow place, situated on the top of the cylindrical mass of brick-work, from which it passes off in an horizontal, iron tube, about seven inches in diameter, suspended near the ceiling, into a chimney situated on one side of the room. These six ovens, which are contiguous to each other in this mass of brick-work, are united by their sides, by walls made of tiles, about an inch and a half thick and ten inches square, placed edgewise, and each oven having its separate canal, furnished with a register, communicating with the fire place. Any one, or more of them, may be heated at the same time without heating the others, or the heat may be turned off from one of them to another, in continual succession, and by managing matters properly, the process of baking may be uninterrupted. As soon as the meat pies or puddings are drawn out of one oven, the fire may immediately be turned under it, to heat it again, while that from under which the fire is taken, is filled with other dishes and closed up.

7. A detail of the utensils in use in a bake-house, may appear uninteresting; and some readers may think it perfectly unnecessary: but

but those bakers who are solicitous to have good bread, would deem the subject incomplete without noticing them.—The following are the most usual and indispensible requisites.—

8. The seasoning tub. This is of the size and shape of the common wash tub, and is intended for mixing the yeast, salt, and water together before the sponge is set.

9. The seasoning sieve. This is a common sized hair sieve, and is used for straining the mixture through, that is prepared for setting the sponge.

10. The warming pot. This is a large copper pot, lined with tin, capable of holding two pails full of water. It is filled and set in the oven to warm, before the baker sets his sponge. These pots are not in universal use, as some people use earthen ones; but this mode of warming the water, however objectionable, is daily practised by the most respectable bakers in the Metropolis.

11. The brass-wire sieve. This is a large round sieve, covered with a sheet of exceeding fine, wove, brass-wire; its use is not only to sift the flour before it is kneaded; but also to detect any lumps, or other impurities, that may be contained in it.

12. The pail.

13. The bowl.

14. The spade. These are requisite for a variety of purposes, and are of the same kind as are in common use.

15. The salt bin. This is a bin, with a lid to it, similar to a corn bin. It will hold two sacks

sacks of salt, and is usually placed near the oven, as salt is apt to get moist if not kept in a dry place.

16. The yeast tub. This is a common, six-gallon cask with a large bung hole and cover, and is used for preserving the yeast.

17. The dough knife. This is usually of the size of a large carver, with a round point and blunt, like a painter's pallet knife. Its use is to cut the dough, when the baker is kneading it, before he throws it over the sluice board. It is also used, when the bread is weighed, to divide the different portions before they are put in the scale.

18. Scales and weights.

19. The scraper. This is a small scraper, like a garden hoe, fixed in a short wooden handle. Its use is to scrape the sides and bottom of the trough, to prevent the dough from adhering and drying there.

20. Marks. These are four large, tin letters, fixed in a wooden handle. One is marked W. another H. a third S.W. and the fourth M.; and every loaf, whether wheaten, household, standard wheaten, or mixed bread, is obliged, in conformity to act of parliament, to be marked with one of these instruments, before it is put into the oven.

21. The rooker. This is a long piece of iron, in shape somewhat resembling the letter L, fixed in a wooden handle. Its use is to draw out the ashes from all parts of the oven to the mouth.

22. The hoe. This is a piece of iron, similar

milar to a garden hoe, fixed in a handle, partly wood and partly iron. Its use is to scrape up such ashes and loose dust as escaped the rooker.

23. The swabber. This is a common pole, about eight feet long, with a quantity of wet netting fastened to the end. Its use is to clean out the bottom of the oven, after the ashes have been removed, previous to setting in the bread.

24. Peeles. There are usually four peeles kept in a bakehouse, viz. the quartern peele, to set in the quartern loaves; the half quartern peele, for the half quartern loaves; the drawing peele, for drawing out the bread; and the peele for placing and removing the tins. The quartern peele is a pole about eight feet long, with a wooden blade, about a foot wide and sixteen inches long, fixed at the end with strong screws. The half quartern peele is of the same kind, about half the length, and much smaller. The drawing peele is a strong pole, ten feet long, with a blade, thicker, broader, and longer than the others; and the peele for setting in the tins has a strong blade of iron, instead of wood, which is fixed with screws into the handle.

25. Tins. These are iron plates of different sizes. The most usual are about an eighth of an inch thick, two feet wide, and three feet long. The rolls, pies, and puddings are put upon these tins, and then the baker runs the blade of the peele under each of them, and places them into any part of the oven he desires, with the utmost facility.

26. Flan-

26. Flannels. These are squares of coarse flannel, and are used for covering up the bread and rolls, after they are taken out of the oven.

27. The rasp. This is a large, coarse, broad, flat, steel file, with a wooden handle that runs over the back. Its use is for rasping the burnt crust off the bread, and a finer one is kept to rasp the French rolls.

28. Many private families, who bake their own bread, have an iron oven, erected in the kitchen on one side of the fire-place, which is heated by a flue that passes from the grate. Although this is, in many respects, a neat and convenient way of heating an oven, yet the manner of managing the fire renders it expensive, as a great deal of fuel is unnecessarily wasted. To obviate this inconvenience, Count Rumford * has recommended that the oven be heated by a separate fire-place, built under it, and made not more than six inches wide, nine inches long, and six inches deep. A grate of these dimensions is sufficient to heat an oven eighteen inches wide, twenty-four inches long, and from twelve to fifteen inches high; taking care to place the grate at least twelve inches below the bottom of the oven; and, in order to prevent the fire from operating with too much violence upon any one part of the oven, the brick-work should be sloped outwards and upwards on every side, from the top of the burning fuel, to the ends and sides of the bottom of the oven, that the whole may be exposed to the

* Count Rumford's Experimental Essays, vol. 3. p. 175.

the direct rays of the fire. If the fire-place be built in this manner, and properly managed, it is almost incredible how small a quantity of fuel will answer for heating it and keeping it hot. In these small fire-places there is always a very strong draft of air passing into them, and this circumstance, which is unavoidable, renders it necessary to keep the fire-place door constantly closed, and to leave but a small opening, for the passage of the air, through the ash-pit. If these precautions are neglected, the fuel will be consumed very rapidly, the bottom of the oven will be burnt, and the oven will get chilled as soon as the fire-place ceases to be filled with burning fuel.

29. In the construction of ovens for cottages, a less degree of nicety is required; and our attention must be directed to those materials that are cheap, and can be procured with facility, as the poor are often deprived of the benefit of an oven, from the expense of erecting one. The following method of making ovens, universally practised by every farmer in Canada, is described by the Honourable Captain Cochrane*, and is worthy of imitation and adoption in this country, as the poorest person may make one, at little or no expense, with only a little pains and trouble.

30. At a small distance from the house make a platform, of about six or seven feet square, of earth, stone, or wood, raise it about three feet from the ground, procure a quantity of

* Cochrane's Seaman's Guide, p. 29.

of clay, and one third sand, beat and mix them well with water to the consistence of brick earth; with this clay cover the top of the square, about six or seven inches thick, and level it properly.

31. Then provide a number of laths, twigs, or small branches of trees, that will easily bend in an oval shape, and on the moist clay mark out the size of the oven, leaving at one end a vacancy for the door, in proportion to the size, sticking the ends of them into the clay. When finished it will appear like a basket overset. Then begin and plaster it over with clay, about an inch at a time, and when it has dried a little, lay on more, until it is about eight or nine inches thick. When finished, and dry, fill the oven with wood or coals, and set it on fire, and wherever any cracks are seen in the arch, pour in some clay and plaister it over. The fire must be continued till the whole is burnt to a brick.

32. An oven made in this way, if properly covered from rain, will last a long time, and might be made with little expense, not only by cottagers and farmers, but even in an army, such a one might be erected in the course of a few hours, by a detached party, which would serve, not only for baking their bread, but, also, for roasting and stewing their meat.

CHAP.

CHAP. X.

ON THE MANNER OF REGULATING THE ASSIZE OF BREAD.

SECT. I.

BEFORE the exportation of corn was encouraged in this country, little more was grown than was necessary for the consumption of its inhabitants, as the farmer could never promise himself a certain sale for his commodity; hence, instead of being sold at a moderate and reasonable price, it was frequently so dear *, that the poor knew not the taste of bread. Whereas, at other times, is became so great a drug, as to be sold for twelve-pence the quarter †. Agriculture, under these circumstances, could not be flourishing. The farmer, when wheat was dear,

* In the 43d year of Henry the Third, a quarter of wheat was sold for twenty shillings, when it was to be got; and multitudes of poor people were constrained to eat the bark of trees, and horse flesh; and above twenty thousand died, in London, for want of even this kind of food.

† See the preamble to the statute of the 51st of Henry the Third, for regulating the assize of bread.

dear, could not afford to buy seed to sow his land; so, that, the next year, it was, of course, dearer still: and when, by means of a very favourable season, it happened to be cheap, the farmer, whose wheat lay on his hands for want of purchasers, had neither heart nor spirit to sow for a new crop, when such quantities of wheat lay rotting in his granaries.

2. To remedy these defects, an ordinance* was established, by proclamation, in the fourth year of King John, for fixing the price of bread in England; so that the manufacturer might have a compensation for his time, labour, and capital employed, and the consumer be secured from fraud and imposition. This regulation continued in force till the year 1266, when it was repealed by the statute of assize, made in the 51st year of King Henry the Third, in which the several expenses incurred, and to be allowed to the baker for baking a quarter of wheat, are stated to be seven-pence farthing in money, besides whatever surplus of bread could be made from a quarter of wheat, beyond what the statute allowed.

3. This money allowance was augmented, to the baker in the reign of Edward the First, to one shilling and a penny. And in the twelfth year of Henry the Seventh, it was farther augmented to two shillings and seven-pence. This continued till the thirty-fourth year of Queen Elizabeth;

* Atwood's Review of the Statutes and Ordinances of Assize, p. 2.

Elizabeth; when, in consequence of the representation of the bakers, it was farther augmented to six shillings and ten-pence; but this sum was afterwards reduced to six shillings in cities, and four shillings in other parts of the country; and continued at the same amount during the reigns of James the First, and Charles the First. Whatever alteration might have been made in the allowance, in the intermediate time between the thirteenth of Charles the First, and the eighth of Queen Anne, that statute gives twelve shillings for the expenses of baking a quarter of wheat; and was in force till the thirty-first of King George the Second; when it was increased three shillings and six-pence, making in all fifteen shillings and six-pence a quarter. By the thirty-seventh of his present Majesty the allowance was reduced to fourteen shillings, and the magistrates were enjoined to set the assize from a sack of flour instead of a quarter of wheat, and to allow the baker eleven shillings and eight-pence for his expenses; which, by a subsequent act, has been increased to twelve shillings, besides the profit * in bread, that has been always allowed from time immemorial.

4. When these statutes were first enacted the baker was his own manufacturer, purchasing his own corn and having it ground and separated into flour, bran, and pollard. This flour, from

* This profit, according to the Rev. Mr. Heslop's experiments, appears to be from six to seven quartern loaves in every sack of flour baked.

from an unvaried series of experiments, made from age to age, through the course of many hundred years, appears to be three-fourth * parts in weight of the whole grain of wheat, taking all wheats together, being more in the finer sorts, and less in the coarser; and the bread made from this flour hath always been deemed the standard of the food of bread corn. But, by insensible degrees, the manufacture of bread became separated into two distinct employments.

5. In consequence of this alteration, the baker, having no further connexion with the market for corn, became dependant solely on the mealman, for supplying him with flour, who, not considering himself amenable to the assize laws, made different kinds of flour, some extremely fine and white, while others were very coarse and unpalatable. These artificial whites, when made into bread, were so pleasing to the eye and the taste, that, in the course of a few years, they got into such general use that the people refused any longer to purchase the bread made of the whole of the grain. Parliament, therefore, thought proper to interfere, and directed, that two sorts of bread only should be made for sale, that called the wheaten, which was the kind in common use, and a coarser and cheaper sort called household; and in those places where bread was made of the meal of other grains it was allowed to be continued. But instead of the household, a brown bread, made of a refuse stuff,

† Pownall on the Assize of Bread, p. 28.

stuff, came to market. This the people at large would neither purchase nor eat, and, therefore, the old standard was again ordered to be made; so that, at present, four sorts of bread are allowed to be manufactured by the bakers, which are fully detailed in several acts of parliament, the substance of which I shall endeavour to bring into one point of view, and explain the most material regulations that are at this time in force respecting the same.

6. The bills are divided into two parts, the one containing regulations to be observed by the Lord Mayor and Court of Aldermen of the City of London; and the other contains the regulations to be observed by the magistrates in the other parts of the kingdom. Some sections belong to both, in common, and the conclusion points out the way by which the several penalties are to be enforced; and, finally, a set of tables are annexed, which point out to the magistrates, both in town and country, in what manner they are to settle the price of bread, from the average price either of wheat or flour, which is to be regulated by the price they bear in the neighbouring markets.

7. It shall be required of the court, or person or persons herein after authorized by the different acts to set the assize of bread, that they shall regulate the same by the price the grain, meal, or flour bears in the public markets, at or near the place where such assize shall be set, allowing * to the bakers, for salt, yeast,

* 31 Geo. 2. p. 869. 38 Geo. 3. c. 55. sec. 8. 38 Geo. 3. c. 62. 37 Geo. 3. c. 98.

yeast, baking, and labour, 14s. per quarter, if the assize is set from wheat, and if from flour, 12s. a sack.

8. The said assize shall always * be set in averdupois weight, of sixteen ounces to the pound, and not in troy weight; and in the several proportions directed in the tables, as well as such bread as shall be publicly allowed to be made with the flour of other grains than wheat.

9. That the several sorts of bread made for sale shall be always well † made; and, in their several degrees according to the goodness of the sorts of meal or flour, the same ought to be made of, without any adulteration or mixture, except the genuine meal, salt, water, eggs, milk, and yeast; and that no baker, or his journeyman, shall at any time put into their dough any alum ‡, or mixture in which alum § shall be an ingredient, or any other preparation in lieu of alum, under the penalty of forfeiting any sum of money not exceeding ten pounds, nor less than five; and in default of payment, such baker, or his journeyman, shall be committed to the house of correction, or some other prison, and there kept to hard labour, for any time not exceeding six calendar months; and the magistrate before whom such offender is convicted, is likewise required to publish his name, offence,

* 31 Geo. 2. p. 871.
† 31 Geo. 2. p. 882.
‡ 37 Geo. 3. c. 98. sec. 21.
§ To detect alum in bread, see page 91. chap. 6.

offence, and place of abode, in some newspaper which is printed or circulated in or near the place where such offence is committed.

10. That no baker shall sell, or expose for sale, any bread which shall be deficient in weight; and every person convicted thereof shall forfeit a sum not exceeding five shillings*, nor less than one shilling, for every ounce that shall be found deficient in the weight of every loaf; and if it is less than an ounce of what it ought justly to weigh, then he shall forfeit a sum not exceeding two shillings and sixpence, nor less than sixpence, at the discretion of the magistrate before whom he is convicted, provided such bread complained of be weighed before a magistrate, within forty-eight† hours after the same shall be baked. Yet, notwithstanding, if the baker can make out, to the satisfaction of the magistrate, that the deficiency arose from some unavoidable accident, or was occasioned by some contrivance or confederacy, then the penalty shall not be enforced.

11. That every baker, before he exposes his bread for sale, shall cause every loaf to be fairly marked: that is to say, upon every loaf of wheaten bread there shall be imprinted a large Roman W‡; upon every loaf of household bread a large Roman H; and upon every loaf of standard wheaten bread the letters S W§. And every person who shall make or

* 31 Geo. 2. p. 885.
† 39 and 40 Geo. 3. c. 74. sec. 4.
‡ 31 Geo. 2. p. 886.
§ 13 Geo. 3. c. 62.

sell any bread that is not so marked, (unless such loaves are rasped, by the particular desire of the person who purchases them) shall forfeit, for every offence, a sum not exceeding five shillings *, nor less than one.

12. That no baker, or other person selling bread, shall demand or take any higher † price than such shall be ordered to be sold for by the magistrate setting the assize and price; and no baker shall refuse ‡ to sell any bread under the expectation of its rising the next day, when he shall have more than is necessary for the immediate use of his family and customers; and whoever is convicted of such offence shall forfeit and pay a sum not exceeding forty shillings, nor less than ten.

13. That any baker, or other person, who shall offer to sell any bread of an inferior ‖ quality to wheaten, at a higher price than household bread shall be set at by the assize, shall, on conviction, forfeit, at the discretion of a magistrate, a sum not exceeding ten pounds §, nor less than forty shillings, for every such offence.

14. That the peck loaf of each sort of bread shall weigh, when baked, seventeen pounds, six

* 38 Geo. 3. c. 55. sec. 10.

† When it shall so happen, that it is necessary to split a farthing in selling a *single* half-quartern loaf, then the baker may sell it at half a farthing higher than is allowed in the table.

‡ 31 Geo. 2. c. 29. p. 886. 38 Geo. 3. c. 55. sec. 12.

‖ 31 Geo. 2. c. 29. p. 887.

§ 38 Geo. 3. c. 55. sec. 18.

six ounces, averdupois*; the half peck, eight pounds, eleven ounces; the quartern, four pounds, five ounces, eight drachms, and the rest in proportion. So that the magistrate, by knowing that twenty peck loaves, forty half-pecks, and eighty quarterns, are upon the average produced from a sack of flour, weighing two hundred weight two quarters, may at all times know if the baker hath more than the allowance he intends to give him.

15. That, in such places where an assize is set, no sort of bread shall be made for sale, except wheaten and household, otherwise called brown bread; under the penalty of forfeiting not more than forty, nor less than twenty shillings for every such offence. But in those districts where it hath been the custom to make standard† wheaten bread, and bread of the meal or flour of rye‡, barley, oats, beans, and peas, or with the meal or flour of any such different sorts of grain mixed together, the magistrates, if they think proper to allow such to be continued, may give leave for the same to be sold within the limits of their respective jurisdictions.

16. That the assize of bread for the City of London and liberties thereof, and for the weekly bills of mortality, and within ten miles of the Royal Exchange, shall be regulated in the following‖ manner, by the Lord Mayor and

* 31 Geo. 2. ch. 29. p. 870.
† 13 Geo. 3. c. 62. sec. 1.
‡ 31 Geo. 2. c. 29. p. 869.
‖ 37 Geo. 3. c. 68. sec. 1.

Court of Aldermen, and in all places without his jurisdiction, it shall be regulated in the manner herein-after described.

17. That every corn meter of the City of London, who is employed in measuring out wheat, shall, before twelve o'clock every Monday noon, enter into a book at the corn meters' office, according to the following form, an account of all wheat measured out and delivered by such corn meter in the course of the preceding week, with the names, occupations, and places of abode, of the respective buyers and sellers.

FORM OF CORN METER's ENTRY.

Corn Meters' Office, London, 1802.

Entry of the several quantities of wheat worked by the Sworn Corn Meters of the City of London, in six days, from Monday the 25th of October, to Saturday the 30th, both inclusive.

Day of the Month.	From where worked.	Seller's Name.	Buyer's Name.	Quantities of Wheat.	Meter's Name.	Lighterman or to whom delivered.
	Whether out of craft, vessel, wharf granary, or wharehouse Mentioning their respective names, and the names of the masters, owners, or occupiers thereof.			Whether Quarter or Bushel.		

18. That

18. That every Monday, before three o'clock in the afternoon, a correct return * or account of wheat which shall have been so entered in the aforesaid book, for the week next but one preceding such Monday, shall be prepared in writing, according to the following form, and certified on oath, which account shall be left at the Cocket Office, at the Mansion House, by the meal weighers of the City of London, who shall enter the same in a book provided for that purpose, and kept at the Town Clerk's Office.

19. That every cornfactor shall deliver every Friday †, before three o'clock in the afternoon, to the said meal weighers, an account of the prices of all the wheat sold and delivered by him from the Monday to the Saturday, both inclusive, in the week next preceding such Friday, with the names and occupations of the respective buyers, and the apparent purposes for which the wheat shall have been sold.

20. That a general return ‡ of the quantities of all such wheat as shall have been sold and delivered within the City and Liberties of London and Bills of Mortality, or within ten miles of the Royal Exchange, in the course of the preceding week but one, together with the average price of such wheat, shall be prepared by the meal weighers, from the above accounts, every Monday afternoon, before three o'clock, which account shall be entered, before five

* 37 Geo. 3. c. 68. sec. 2.
† 37 Geo. 3. c. 68. sec. 3.
‡ 37 Geo. 3. c. 68. sec. 4.

o'clock of the same day, in a book provided for that purpose, and kept at the Town Clerk's Office, according to the following form.

A correct return, from the Corn Meters' Office, of the quantity of wheat worked by the Sworn Corn Meters of the City of London, from Monday the 18th of October, 1802, to Saturday the 23d following, both inclusive.

Mark Lane, 23d Oct. 1802.

	s.		s.	d.
24 Quarters at	70	100 Quarters at	59	0
195 ——— at	69	70 ——— at	59	0
396 ——— at	68	816 ——— at	58	0
102 ——— at	67	495 ——— at	57	0
635 ——— at	66	1202 ——— at	56	0
906 ——— at	65	28 ——— at	55	6
676 ——— at	64	83 ——— at	55	0
413 ——— at	63	1260 ——— at	54	0
352 ——— at	62	230 ——— at	52	0
966 ——— at	60			

Total 8949 Quarters. Average 60s. 2d.

CHILD AND MALPAS,
Meal Weighers.

21. That every cornfactor* before he shall begin to deal, by commission, in the sale of wheat, shall take an oath, (or being one of the people called Quakers, affirm) that all the accounts which he shall deliver to the meal weighers,

* 37 Geo. 3. c. 68. sec. 5.

weighers, respecting the quantities and prices of wheat sold by him, shall, to the best of his knowledge, contain the whole quantity, and no more, of the wheat sold and delivered by him within the period to which such accounts shall refer, with the names and occupations of the buyers, and the prices thereof respectively; which oath, or affirmation, the Lord Mayor is to deliver and grant a certificate thereof to be registered in the Town Clerk's Office, without any fee or reward. And in case any person shall carry on the business of a cornfactor, without taking the said oath, he shall forfeit the sum of fifty pounds.

22. That every baker who shall make bread for sale, within the City of London, or the Liberties thereof, or the weekly Bills of Mortality, shall prepare, and leave every Saturday *, before eleven o'clock in the forenoon, at the Cocket Office in the Mansion House, a true and particular account, in writing under his hand, of all such meal and flour, for the purpose of making wheaten bread, as shall have been bought by such baker in the course of the week next preceding such Saturday, specifying the names of the respective sellers, quantities, sorts, and prices at which the same shall have been actually sold, according to the following form; and every baker residing without the Bills of Mortality, and within ten miles of the Royal Exchange, shall cause his account to be delivered before five o'clock in the afternoon of the said day.

* 38 Geo. 3. c. 55. sec. 1.

An Account of all the meal and flour, made of wheat, bought by me, Thomas Jones, of Aylesbury Street, in the parish of Clerkenwell, baker, from Saturday the 25th of October, 1802, to Friday the 31st, both inclusive, for the purpose of making wheaten bread, or fit for the same.

Day of the Month.	Seller's Name.	Number of Sacks.	Sorts of Meal or Flour.	To what purpose applicable.	Prices per Sack.		TOTAL.		
					s	*d*	£	*s*	*d*
1802.									
October 26.	T. Scott.	2	Household..	For wheaten bread	at 51	0	5	2	0
29.	Do.	1	Seconds.....	For household Do.	at 46	8	2	6	8
30.	Do.	3	Household..	For wheaten Do.	at 50	6	7	11	6
						£	15	0	2

N. B. The fine flour, bought for pastry, is not returned.

23. And for the better enabling the bakers to prepare such accounts, there shall be delivered with every quantity of meal or flour, a true and perfect bill * of parcels signed by the seller of such flour, with the name of the buyer, and the real quantities and prices thereof, and also the day of the month on which the same shall have been delivered; and in default thereof the seller shall forfeit, on conviction, for such offence, the sum of forty shillings, and the buyer shall forfeit the same sum for receiving such meal or flour without a bill of parcels.

24. And, in order that the bakers may prepare such accounts more accurately, there shall be provided, by the clerk † of the Cocket Office, a sufficient number of printed forms ‡ of such accounts, with blanks ready to be filled up, which shall be delivered to the bakers at the rate of one shilling and six-pence per hundred, which printed form, so provided and obtained, shall alone be made use of.

25. And when bakers have not ‖ purchased any meal or flour within the preceding seven days, they shall, notwithstanding, return to the Cocket Office one of the printed forms, with the word "none" written in the column entitled, "number of sacks," and specifying particularly the street, place, and parish where such baker shall dwell and carry on his business.

26. And whereas it has frequently § happened,

* 37 Geo. 3. c. 68. sec. 7.

† 38 Geo. 3. c. 55. sec. 2.

‡ 1500 of these papers are received at the Cocket-Office, properly filled up, every week.

‖ 38 Geo. 3. c. 55. sec. 2.

§ 37 Geo. 3. c. 68. sec. 8.

pened, that large quantities of meal or flour have been delivered to buyers thereof, without any price having been fixed or agreed on for the same at the time of delivery, now, as this is contrary to the above regulations, and may prevent, or render imperfect, the general return, any person buying or selling meal or flour, within ten miles of the Royal Exchange, contrary to the above regulations, shall, on conviction thereof, forfeit the sum of twenty pounds *.

27. That if any baker within the City of London, or within ten miles of the Royal Exchange, or any meal weigher, cornfactor, corn meter, or clerk of a market, shall in anywise neglect †, omit, or refuse to make and deliver such accounts, or returns, filled up and signed as hereby directed, or shall designedly deliver or leave a false account or return, then every person so offending shall forfeit, for every offence, any sum not exceeding ten pounds, as the magistrates shall think fit to order.

28. That if any baker, within the City of London, or within ten miles of the Royal Exchange, shall at any time corruptly receive any gift ‡, or money, either directly or indirectly, from any mealman or other person from whom he shall have bought, or intended to buy, any meal or flour, or shall receive any flour at a less cost than is specified in the bill of parcels, then every mealman so corruptly making such gift

* 38 Geo. 3. c. 55. sec. 6.
† 38 Geo. 3. c. 55. sec. 6.
‡ 38 Geo 3. c. 55. sec. 7.

gift or allowance, as also every baker for receiving the same, shall for every such offence forfeit and pay any sum not exceeding twenty pounds, nor less than five.

29. That every baker, within ten miles of the Royal Exchange, shall, within one calendar month * from the time he shall begin to make bread for sale, take an oath, (or being one of the people called Quakers, affirm), that the accounts which he shall from time to time leave at the Cocket Office in the Mansion House, concerning all meal or flour bought by him, shall, to the best of his belief, contain the whole quantity, and no more, of the flour bought by him within the period to which each account shall refer, with the names of the sellers, and prices respectively, without collusion; and he shall further swear, that he does not use, nor cause to be used, any alum, or other pernicious ingredients, in his bread or rolls; which oath, or affirmation, the Lord Mayor of the City of London, or any other justice of the peace within whose jurisdiction such baker shall reside, is to administer, and grant a certificate thereof to be registered in the Town Clerk's Office, without any fee or reward; and in case any person shall carry on the trade of a baker, without taking such oath, he shall, on conviction, forfeit the sum of five pounds.

30. That a general return † of the quantity, sorts, and prices of all such meal and flour as shall have been bought by the bakers, within ten

* 38 Geo. 3. c. 55. sec. 4.

† 37 Geo. 3. c. 68. sec. 5. and 38 Geo. 3. c. 55. sec. 5.

ten miles of the Royal Exchange, in the course of the preceding week, together with the average price thereof, shall be made up from such accounts by the meal weighers, every Monday, before three o'clock in the afternoon, which accounts shall be entered, before five o'clock the same afternoon, in a book provided for that purpose, and kept at the Town Clerk's Office.

A RETURN OF FLOUR,

From Oct. 23, to Oct. 29, from the Cocket Office.

Mansion House. 29 Oct. 1803.

	s.	d.		s.	d.
28 Sacks at	57	0	9 Sacks at	51	6
35 —— at	55	8	15 —— at	51	0
12864 —— at	55	0	20 —— at	50	6
35 —— at	54	6	180 —— at	50	0
830 —— at	54	0	37 —— at	49	0
20 —— at	53	6	7 —— at	47	10
466 —— at	53	0	7 —— at	45	8
80 —— at	52	6	15 —— at	34	3
329 —— at	52	0	7 —— at	30	0

Total 14,984 Sacks. Average 54s. 8¼d.

31. And for the more effectually enabling * the said meal weighers to prepare, and render correct, such accounts, every buyer or seller of meal, within ten miles of the Royal Exchange,

* 37 Geo. 3. c. 68. sec. 11.

change, shall, at the request of one or more of the meal weighers, inform them of the real price of any quantity of meal or flour made of wheat, which shall have been sold by him within the space of fourteen days, then last past, and the several apparent purposes for which the same shall have been bought, together with the name and occupation of the buyers.

32. And it shall be lawful for the Lord Mayor*, Court of Aldermen, or any of his Majesty's Justices of the Peace acting for such district, to order any baker, at whose shop any such bill of parcels, of meal or flour made of wheat, as shall have been delivered at any time within the space of fourteen days, to produce the same, before the court, for the examination of the meal weighers; and in case any baker shall not, within seven days after such order is given, produce such bill of parcels, he shall forfeit the sum of five pounds.

33. And for the more effectually† carrying these regulations into execution, it is required, that all returns specifying the quantities of wheat, shall be computed by the quarter, each quarter containing eight Winchester bushels; and flour shall be computed by the sack, which shall contain five bushels or two hundred and eighty pounds weight.

34. That on every Tuesday‡, being the next day after every weekly return of wheat from the meal weighers for the week next but one

* 37 Geo. 3. c. 68. sec. 12.
† 37 Geo. 3. c. 68. sec. 14.
‡ 37 Geo. 3. c. 68. sec. 15.

one preceding, and being also the next day after the returns of flour from the bakers for the week next preceding, the assize and price of bread shall be set by the Court of Mayor and Aldermen of the City of London, if the Court shall then sit, and if not, by the Lord Mayor, either from the average price of wheat, fit for making wheaten bread, or from the average price of flour, as near as possible, according to the table A. Thus, suppose the Court think fit to set the assize of bread from the price of flour, and that is returned at fifty-five shillings a sack, including the bakers allowance of eleven shillings and eight-pence, for salt, yeast, baking, and labour, as also the four-pence a sack for the new duty on salt *. They will therefore refer to the sum 55s. in the column, from whence it will appear that the peck loaf is then to be sold for three shillings and four-pence. His Lordship will, therefore, direct that the quartern loaf shall be sold for ten-pence; and the assize of bread so set, shall take place on the Thursday following, and be in force in the City of London and Liberties thereof, and the weekly Bills of Mortality, and within ten miles of the Royal Exchange, and remain in force from that time until a new assize is set.

35. Upon referring to the foregoing table, it

* See 38 Geo. 3. c. 55. sec. 8. for the additional allowance to the bakers of five-pence on a quarter of wheat, and four-pence on a sack of flour, in consequence of the additional duty on salt.

it will be found, that ninety-eight shillings and four-pence is the highest * sum mentioned, as the price of a sack of wheat flour, including the bakers allowance for baking the same; but if it should at any time exceed that sum, then the assize and price of bread may be set at whatever price wheat may be at, the Magistrates observing to regulate it as near as possible in the same proportion as is stated in the table.—Thus, supposing the average price of wheat flour is returned by the meal weighers at eighty shillings a sack, each quartern loaf, according to the above table, will be one shilling and a penny three farthings; therefore, if at any time that price should be doubled, it will come to eight pounds a sack, making the quartern loaf two shillings and three-pence halfpenny; and this rule is to be observed in the same proportion as the price of wheat or flour either increases or diminishes.

36. And, whereas, in setting the assize of bread in conformity to the above directions, it frequently happens, that the average price of wheat, or of flour, returned, does not agree † with any of the prices specified in the table A, and the assize is then set from the price in the said table nearest the said average price returned; consequently, the price of a quartern loaf is at times higher than it should be, to the injury of the public, and other times not so high,

* 39 and 40 Geo. 3. c. 74. sec. 1,
† 38 Geo. 3, c, 55, sec, 9,

high, to the injury of the baker. To remedy this inconvenience the act requires, that, whenever there shall be any difference between the average price of wheat or of flour returned, and the price from which the assize shall be set, the amount of such difference of price shall be entered in a book to be kept at the Cocket Office, and when it shall appear, that, upon such difference being added together, they amount to a sufficient sum, either in favour of the public or the baker, to make a variation in the price of bread half an assize, then the Lord Mayor shall make such addition or deduction from the average price of wheat or flour, and, in setting the next assize of bread, shall either raise or lower the same one half an assize, as the case may require.

37. That no unfair advantage* may be taken of the baker, it is required, that before any advance or reduction is made in the price of bread, that the meal weighers shall leave in writing, at Bakers Hall, a copy of the last returns of wheat and flour, that the Master and Wardens of the Bakers Company may have an opportunity, before the assize is set, of offering to the Lord Mayor and Aldermen any objections they may think fit against any advance or reduction being that day made in the price of bread.

38. That if in any place within ten† miles of the Royal Exchange, any six-penny, twelve-penny, or eighteen-penny loaves shall be allowed

* 37 Geo. 3. c. 98. sec. 15.
† 37 Geo. 3. c. 98. sec. 17.

lowed to be made and sold, no peck, half-peck, or quartern loaves shall be permitted to be sold at the same time, lest any of these sort of loaves might be sold designedly, or otherwise, for some other, to the injury of unwary people; and whoever shall be guilty of such offence, shall, on conviction before a magistrate, forfeit a sum not exceeding forty shillings, nor less than twenty.

39. That when the assize is set for such loaves, the weight, whether of wheaten or household, shall be set as nearly as possible in conformity to table B. Such loaves weighing, in their several proportions, according to the price of wheat or flour; and if at any time the price of a sack of wheat flour shall exceed ninety-eight* shillings and four-pence, including the bakers allowance, then the Magistrate is to regulate it in the same proportion as is stated in the table, observing that the respective weights of the several assized loaves will decrease in the same proportion as the price of a sack of flour increases in value; thus, supposing the sack of flour, together with the bakers allowance, is forty-one shillings and eight-pence, according to table B, the twelve-penny loaf should weigh six pounds, eight ounces, four drachms; therefore, if at any time that price should be doubled, the weight of the loaf can only be half what it then was, and, therefore should weigh but three pounds, four ounces, two drachms, and this rule

* 39 and 40 Geo. 3. c. 74. p. 611.

rule is to be observed in the same proportion as the price of wheat or flour either increases or diminishes.

40. That in such places where an assize is set for household* bread, the price shall be regulated by the price that wheaten bread is ordered to be sold at, according to table C; the Magistrate observing, that the quartern loaf is always to be sold for three-halfpence less, let the price of household flour be what it may.

41. That in such places where an assize is set for standard wheaten bread, the magistrate will observe, that the act† directs that the flour such bread is made of, shall be the whole produce of the grain, the bran or hull excepted, and which shall weigh three fourth parts of the wheat from whence it was made, without any mixture or addition, and that the loaves are to be of the same weight as that directed for wheaten; and in fixing the assize in those places where this bread is sold, together with wheaten and household, the proportion they bear to each other is to be as follows; that is to say, when a quartern loaf of wheaten bread is sold for eight-pence, the same weight of the standard wheaten bread shall cost seven-pence, and the same weight of household bread shall cost six-pence-halfpenny, and where it is made alone, then the assize is to be regulated by

* 31 Geo. 2. c. 29. p. 870.
† 13 Geo. 3. c. 62. p. 8.

by the price wheat bears in the neighbouring markets, as is farther explained in table D.

42. That in such places where an assize is set for mixed * bread, or bread made of the flour or meal of barley, oats, rye, peas, or beans, the same is to be regulated at the discretion of the Magistrates, according to the directions given in table E.

43. That the Mayor †, Aldermen, Bailiffs, or other chief Magistrates of such Cities, Towns Corporate, or Boroughs as are without ‡ the jurisdiction of the City of London, or two or more Justices of the Peace in such towns and places where there is no Mayor, Bailiffs, or Aldermen, shall, from time to time, as there shall be occasion within their several respective jurisdictions, cause the respective prices which the several sorts of grain, meal, and flour shall sell for in the public markets in or near every such Town, City, &c. which accounts shall be given in, and certified upon oath, on such days and by such persons as the aforesaid Magistrates shall appoint, and these returns they are afterwards to see entered in a book provided for that purpose; and within two or more days after every such price shall be so returned, the assize and weight of bread, and the price to be paid for the same, shall be set and is to take place on such day and be in force

* 31 Geo. 2. c. 29. p. 871.
† 31 Geo. 2. c. 29. p. 872.
‡ i. e. More than ten miles from the Royal Exchange.

force for such a time, not exceeding seven days from the setting thereof, and shall be made public in such a manner as the aforesaid magistrate directs.

44. That if any two* or more Justices of the Peace of Counties at large, Ridings, or Divisions shall at any time think fit to set an assize of bread for any place or places within the limits of their respective jurisdictions, they are empowered, by the act, to cause the clerk of the neighbouring corn markets to make a return, on oath, of the price which grain and flour fit for making bread shall sell for; and such return shall be delivered to the justices so ordering it, on some certain day in every week, and the said clerk shall enter the same in a book provided for that purpose; and within two days after every such return, the assize shall be set for a period not exceeding fourteen days, and shall commence at such a time, and be published in such a manner as the Justices shall order or direct.

45. The following is the form of the return of the price of grain, meal, and flour, delivered to the Magistrates by the clerks of the country corn markets.

* 31 Geo. 2. c. 29. p. 874.

The

The prices of grain, meal, and flour, as sold in the Corn Market at Lynn, in the County of Norfolk, the 17th day of October, 1802.

		s.
The best wheat per quarter.....	at	55
The second ditto, ditto.....	—	48
The third ditto, ditto.....	—	43
The best wheaten flour per sack	—	50
Household flour, ditto.....	—	48
Rye, per quarter.....	—	36
Rye meal, per sack	—	30
Barley, per quarter.....	—	28
Barley meal, per sack.....	—	23
Oats, per quarter.....	—	23
Oatmeal, per sack.....	—	20
White peas, per quarter.....	—	52
White pea flour, per sack	—	48
Beans, per quarter.....	—	37
Bean flour, per sack.....	—	33

CHARLES JOHNSON,

CLERK.

46. That any baker * in such City, Borough Corporate, or place where the assize of bread is set, shall have liberty, the day after the return is made, to see the entry of the price of grain and flour without paying any thing for the same, that he may have an opportunity before

* 31 Geo. 2. c. 29. p. 875.

before the assize is fixed to make any reasonable objection against any advance or reduction in the price of bread being made at that time.

47. That no baker shall be liable or compelled to pay any fee * or gratuity to any person or persons in consequence of the setting, altering, or publishing the assize of bread.

48. That the Justices at a general Quarter Session may fix the jurisdiction of any hundred † or place within a certain district, so as the assize of bread set for the same may extend thereto; in so doing it is not meant that they shall exclude the Magistrates residing in such districts from setting the assize in their own divisions, but to prevent any dispute as to the limits of such hundred or place.

49. That every clerk of a market who is appointed to make out the returns shall copy ‡ the same into a book kept by him, and also the rate at which the price, assize, and weight of bread shall be set within the limits of his jurisdiction, which book any inhabitant shall be at liberty to inspect without fee or reward.

50. That after an assize of bread shall be set, no ‖ alteration shall be made therein in any subsequent week, either to raise the same higher, or sink it lower, unless the price of wheat or other grain shall vary two shillings in

* 31 Geo. 2. c. 29. p. 875.
† 31 Geo. 2. c. 29. p. 878.
‡ 31 Geo. 2. c. 29. p. 878.
‖ 31 Geo. 2. c. 29. p. 879.

in the quarter since the last return. No provision being made in the assize tables, for altering any assize, when the variation in the price of wheat, or other grain, shall not, in any week, have amounted to three-pence a bushel.

51. That, in case any dealer in corn or meal shall refuse* to disclose, on reasonable request, to one or more of the meal weighers of the city of London, or to the clerks of the markets in other places, the true prices of the several sorts of grain, meal, or flower, which shall be bought or sold in the public markets, or shall give in a false or inconclusive price, he shall forfeit, for every such offence, a sum not exceeding ten pounds.

52. That, if the Lord Mayor,† or any magistrate‡ without his jurisdiction, shall suspect a false return to be made, he may, at any time within the space of fourteen days, summon any person likely to give information, and examine them upon oath, as to what rates and prices the several sorts of grain and flour were really sold for, or bought at; and if the person so summoned shall neglect or refuse to appear, or refuse to disclose such lawful questions as may be proposed, he shall forfeit any sum not exceeding ten pounds. And if it appear, after such examination, that the person has wilfully forsworn himself, he shall be indicted and prosecuted for wilful and corrupt perjury; or if, at any

* 37 Geo. 3. c. 98. sec. 19.
† 37 Geo. 3. c. 98. sec. 20.
‡ 31 Geo. 2. c. 29. p. 880.

any time afterwards,* he shall wilfully break any such oath, he shall be liable to the pains and penalties which persons convicted of perjury are subject and liable to.

53. That whenever any magistrate, without† the jurisdiction of the city of London, shall order any bread to be made with the flour or meal of any other grain than wheat, or a mixture thereof, all bakers are to conform to such order, and to make their bread of such weight and goodness, and at such price, as shall be directed, under the penalty of forfeiting a sum not exceeding five pounds, nor less than forty shillings.

54. That no person shall put into any corn,‡ meal, or flour, which shall be ground, dressed, bolted, or manufactured for sale, any ingredient or mixture whatsoever, whereby the same may be adulterated, or shall sell any flour of one sort of grain as for the flour of another, but shall only sell the real genuine meal or flour of the grain the same shall import to be, under the penalty of five pounds for every such offence.

55. That if any person have cause to suspect that any miller§ who grinds, dresses, or bolts any grain for toll or reward, or manufactures any flour for sale, or that any baker mixes up with his flour any mixture or ingredient, not the genuine produce of the grain, so that the purity of the meal shall in any wise be adulterated, and

* 38 Geo. 3. c. 55. sec. 18.
† 31 Geo. 2. c. 29. p. 882.
‡ 31 Geo. 2. c. 29. p. 883.
§ 31 Geo. 2. c. 29. p. 888.

and reports the same on oath to a magistrate,—then, in that case, such magistrate, or a peace-officer duly authorised by him, shall enter the premises of such suspected person, and search or examine whether such mixture or ingredient, not the genuine produce of the grain, is in the possession of such miller, mealman, or baker; and such meal and flour as shall be deemed to have been adulterated may be seized, together with the base mixtures; and if seized by a peace-officer, it is to be carried before a magistrate, but if seized by the magistrate, he may immediately dispose of it as he shall think fit. And the person on whose premises such mixture or ingredient shall be found, and adjudged to be intended to be used in adulterating the flour, shall forfeit a sum not exceeding ten pounds, and have his name, offence, and place of abode, published in some newspaper that is printed or circulated near his place of abode, unless he shall make it appear, to the satisfaction of the magistrate, that the same was not lodged there with the intention of adulterating the flour, but for some other lawful purpose.

56. That if any person shall wilfully obstruct* or hinder any search being made for such mixtures as are designed to adulterate the meal or flour, or shall oppose their being carried away, such persons shall forfeit a sum not exceeding five pounds, nor less than forty shillings.

57. And that the good design of these regulations may be more effectually accomplished, it

* 31 Geo. 2. c. 29, p. 889.

it shall be lawful for the several wardmote* inquests of the city of London, or any magistrate†, or peace-officer authorised by a warrant from such magistrate, without the jurisdiction of the city of London, to enter into any bake-house, or shop, at all seasonable times, to search for and weigh all the bread therein, and if any of the loaves are found wanting in the goodness of the stuff of which they should be made, or deficient in the due baking or working thereof, or shall be wanting in the weight, or shall not be truly marked,—such persons may seize such bread, and, if a magistrate is not present, it shall be taken before one, who may dispose of it as he shall think fit.

58. That if any person shall wilfully‡ obstruct or hinder any such search, or prevent the carrying the same away, he shall, on conviction before a magistrate, be fined a sum not exceeding five pounds, nor less than twenty shillings.

59. That it shall be lawful for any magistrate§, or peace-officer, authorised by a warrant, and accompanied by one or more master bakers, to enter, at seasonable times, any shop or bake-house within the city of London, or within ten miles of the Royal Exchange, to search and examine whether any alum, or other ingredients, shall have been mixed up with, or put into, any meal, flour, dough, or bread, in the possession of any such baker, and also to search for alum, or

* 37 Geo. 3. c. 98. sec. 22.
† 31 Geo. 2. c. 29. p.
‡ 31 Geo. 2. c. 29. p. 890.
§ 38 Gee. 3. c. 55. sec. 14 and 15.

or any other ingredients, which may be intended to be used for the purpose of adulterating the bread; and if, on enquiry, they find any alum, or other unlawful ingredients, or that any flour, meal, dough, or bread, contains any preparation of alum, such shall be immediately seized, and carried before some magistrate within whose jurisdiction the baker lives, and who shall dispose of it as he shall think fit. And if the magistrate is satisfied that such pernicious ingredients were put into the bread with the consent or privity of the baker, or if he acknowledges it himself, or one or two credible witnesses certify, on oath, that they know he uses alum, such baker shall forfeit any sum of money not exceeding twenty pounds, or be committed to, and kept to hard labour in, the house of correction, or some other prison, for six calendar months, unless he can prove, to the satisfaction of the magistrate, that the alum, or other ingredients, were designed for some lawful purpose. And farther, the magistrate is expressly required to cause the offender's name, place of abode, and offence, to be published in some newspaper which shall be printed or published in or near the city of London, or the liberties thereof.

60. That if any person or persons shall wilfully obstruct* or hinder such search or seizure, as above described, he or they shall, for every offence, forfeit and pay any sum not exceeding ten pounds, nor less than five, at the discretion of

* 38 Geo. 3. c. 55. sec. 16.

of the magistrate before whom the offender or the offenders shall he convicted.

61. That where any baker* shall make a complaint before a magistrate, and make it appear that any offence he was charged with, and paid the penalty of, was occasioned by the wilful neglect or default of his journeyman, or other servant, the magistrate shall issue his warrant for apprehending the party, and if, on examining into the matter, it appears that such was the case, such journeyman, or other servant, shall be directed immediately to pay to his master a reasonable recompence in money, and, on non-payment thereof, he shall be committed to the house of correction, or some other prison, and kept to hard labour, for any time not exceeding one calendar month, unless payment be sooner made.

62. That no corn meter,† meal weigher, clerk of the market, or other person employed in preparing, making, or keeping any such general returns of meal or of flour, as are directed by the several acts to be made, shall, on any account, permit such returns as are made by the parties concerned to be inspected, or any of the particulars thereof made known to any person, without the order of the Lord Mayor, or such magistrate as such returns are intended to be examined by, under the penalty of twenty pounds on conviction, nor less than ten.

63. That if any person concerned‡ in the business

* 31 Geo. 2. c. 29. p. 891. and 38 Geo. 3. c. 55. sec. 17.
† 37 Geo. 3. c. 98. sec. 24.
‡ 31 Geo. 2. c. 29. p. 890.

business of a miller, mealman, or baker, shall presume to act as a magistrate in regulating the assize of bread, or enforcing the other provisions required by the several acts, such person shall incur a penalty of fifty pounds, and whoever informs against the same, may sue and recover such penalty in any of his majesty's courts at Westminster.

64. And, for the better and more easy recovery of the several penalties* incurred by disobedience to the several acts, all offences may be heard and determined in a summary way, by the Lord Mayor, or any other magistrate or magistrates, within their several jurisdictions, who shall summon the offenders before them, and if they do not appear, or offer a reasonable excuse, they may cause them to be apprehended; and when the matter is enquired into, and the party convicted, if he does not pay the penalty within twenty-four hours, such magistrate shall issue a warrant of distress and sale on the goods of the offender; and, should the goods of the party be removed into another jurisdiction, the magistrate thereof is to back the warrant, and the distress, if not redeemed within five days, is to be appraised and sold, and all expences thereby incurred are to be deducted thereout. And if the offender is possessed of no goods or chattels that can be seized, then he shall be committed to the house of correction, or some other prison, for one calendar month, unless payment be sooner made.

65. That

* 31 Geo. 2. c. 29. p. 892. and 38 Geo. 3. c. 55. sec. 19.

65. That if information,* on oath, is offered to any magistrate, that any one within his jurisdiction is likely to offer or give material evidence in behalf of the prosecutor of any offender, and refuses voluntarily to come forward, such magistrate shall issue a summons to cause him to appear, and if he still refuses, to grant a warrant to compel his attendance, and then if he refuses to be examined, he may be committed to some public prison for fourteen days.

66. That no certiorari†, letters of advocation, or of suspension, shall be granted, to remove any conviction or other proceedings had therein; but if any person is punished, and thinks himself aggrieved by the judgment of a magistrate, he may appeal to the next quarter sessions, and, in such case, the execution of the judgment shall be suspended, upon his entering into a recognisance, with two sufficient sureties, in double the sum such person shall be adjudged to forfeit, to prosecute the appeal, and abide the determination of the justices, at the said quarter sessions, and if he makes good his appeal, he shall be discharged the conviction, and reasonable costs awarded him, which shall be paid by the person who lodged the information.

67. That no person shall be convicted‡ of any offence under these acts, unless the prosecution shall be commenced against him within fourteen days after the offence is committed, except

* 31 Geo. 2. c. 29. p. 894.
† 31 Geo. 2. c. 29. p. 895.
‡ 37 Geo. 3. c. 98. sec. 28.

except in cases of perjury*; and no person who shall be prosecuted to conviction for any offence done or committed against these acts, shall be liable to be prosecuted for the same offence under any other law.

68. And, in order to prevent the justices from being troubled with vexatious prosecutions, the act of the 24th of King George the Second (intitled an Act for rendering the Justices of Peace more safe in the Execution of their Office, and for indemnifying Constables, and others, acting in Obedience to their Orders) shall extend, and under the protection of which they shall not be prosecuted for any dispute that may arise, except under certain limitations.

69. That all penalties, when recovered in pursuance of these regulations, shall be disposed of in the manner following: that is to say, one† moiety thereof to be paid to the informer, and the other moiety to the poor of the parish where such offence shall be committed; and, in case there is no informer, then the whole sum shall be given to the poor of the parish, or applied in such a way as the magistrate, in his discretion, shall think fit.

70. That none of the foregoing rules and regulations shall extend to, so as to prejudice any right or custom of the city‡ of London, or any right of any Lord or Lords of any Leet, or prejudice the ancient right of the Dean and High Steward of Westminster,

* 38 Geo. 3. c. 55. sec. 20.
† 31 Geo. 2. c. 29. p. 897.
‡ 37 Geo. 3. c. 98. sec. 29. 31 Geo. 2. c. 29. p. 889.

minster, or the two Universities of Oxford and Cambridge, either as to setting the price of bread, or punishing a breach of the assize-laws, but they and every of them, within the limits of their several respective jurisdictions, may, as fully and freely as they have hitherto done, set such assize, and punish the breach thereof, any thing herein contained notwithstanding.

APPENDIX.

APPENDIX.

OBSERVATIONS ON THE PROFITS, LOSSES, AND EXPENCES, INCURRED BY A BAKER WHO MANUFACTURES TWELVE SACKS OF FLOUR IN A WEEK.

IT has long been an opinion among many well informed people, that the business of a baker is a very profitable concern, and that, whatever they may assert, there is a latent profit attached to it, which has not yet been satisfactorily explained to the public. This opinion, however general, appears to be a very erroneous one, and founded more on conjecture than knowledge of the subject; for any person, by taking the trouble to investigate the matter fully, may easily discover what a baker's real annual profits are, when once he knows what quantity of flour he bakes in a week, and what hands he employs to manufacture the same into bread. Besides, few trades are so exposed to public enquiry, or the members thereof obliged to give such general credit, incur so many expences, or require so many persons to assist them in conducting it, as the bakers; and were they not, in some measure, to consider themselves as an inferior class in society, and limit their expences accordingly, they would hardly be able to carry it on without continually infringing the assize-laws.

That these observations are founded in fact, is evident from the repeated attempts the bakers have made to have their allowance increased, during the present reign; and in consequence of the unexampled advance in all the necessaries of life, particularly those more immediately connected with their trade, the bakers' company, in the spring of the year 1804, presented another petition to parliament for a farther augmentation to their allowance, and a committee having been appointed to examine into the merits thereof, summoned before them several of the most respectable persons in the trade; and, from the following evidence, taken from persons whose situation in life must render their deposition above all suspicion, it appears that hardly a living profit is attached to the business, insomuch that it is a matter of surprise how persons can be found that are willing to carry it on.

Mr. *Joseph Vere*, Master of the Bakers' Company, being examined on the part of the petitioners, was asked—

What is the present price of yeast?

Two shillings and seven-pence per gallon.

When did the rise upon yeast take place?

Within these two years, I believe.

Have you given that price regularly since that time?

Yes, and sometimes more.

What is the present price of wood?

The first price of wood is one pound per hundred spokes.

What

What is the present price of candles?

The price of candles is twelve shillings per dozen pounds.

What is the present price of salt?

Salt is two pounds thirteen shillings a sack, containing four bushels.

What was the price of salt after the new duty took place?

Fifty-three shillings per sack.

How much does a bushel weigh?

Fifty-six pounds.

What quantity of salt is used in the baking of a sack of flour?

Five pounds.

What is the present amount of journeymen's wages?

One pound two shillings per week, which includes their bread, beer, and lodging.

When did the journeymen raise their wages?

They have been increasing for these three or four years past, and have been at one pound two shillings per week for these three years.

What were they in 1797 and 1799?

In 1797 they were fourteen shillings, and in 1799 sixteen shillings.

What is the expence of making and baking a sack of flour into bread?

Eight shillings and nine-pence farthing, and the baker's profit on the sack is three shillings and two-pence halfpenny.

What is the average quantity of flour baked by a baker per week?

Twelve sacks. How

How many loaves are made from a sack of flour?

Eighty quartern loaves—and a sack of flour will not make more.

Mr. *Thomas Loveland*, one of the Assistants to the Bakers' Company, examined.

Do you pay your journeymen by the day, week, or sack?

By the week, invariably;—the bakers pay them so much per week, and partly board them.

What are they paid per week?

Some bakers pay more, some less. I pay my foreman nineteen shillings per week, in money, and find him in bread, flour, lodging, candles, and other little necessaries, which amount to about five shillings a week besides. My second hand I pay fifteen shillings per week, with the like allowances as the foreman; which two, upon a calculation, stand me in full twenty-two shillings a week each. I have an apprentice, also, and I board him entirely, and find him in clothes and pocket money, and I should suppose he stands me in fifteen shillings per week, at least.

Do you consider the sum of two pounds four shillings as a sum requisite to be expended in labour for the purpose of manufacturing twelve sacks of flour into bread?

If a master works himself, it may be done with one journeyman and an apprentice, but if the master does not work himself, two men must be employed to do that work.

Are

Are not two journeymen and an apprentice capable of manufacturing more than twelve sacks of flour in the week?

Yes, they might manufacture sixteen or eighteen sacks in a week.

Was the price of wages the same last year as at present?

I think nearly so; it has been advancing for these three or four years past; indeed, we can hardly get men to work at any price, as Sir Brook Watson, the army contractor, allows his camp bakers a guinea per week, besides bread and lodging.

Was it the practice formerly for journeymen to board in the house?

Yes.

How long has that practice been discontinued?

About seven or eight years.

Do you apprehend that, in the year 1797, the greater part of the masters boarded their men?

I should suppose they did.

Do you know what difference of wages there is between those who board their men and those who do not?

When I boarded my men, I gave my foreman seven shillings per week in money, my other man five shillings per week; but I do not know what difference is now made.

Do you consider the trade to give no more?

I consider my price to be the first wages.

Is it the practice, in the baking trade, to give premiums with apprentices?

No; quite the contrary; and, besides, we are obliged

obliged to find them in cloaths, as well as board and lodging.

Do you use coals for heating your oven?

Yes, I do; but I believe there is very little difference in the expence, whether an oven is heated with coals or wood.

We understand that, in 1797, the price of wood, in London, was fourteen shillings for one hundred spokes, and now, in 1804, it is said to be one pound the hundred spokes; to what can such an extraordinary increase be attributed?

I do not exactly know, but I understand that wood gets scarcer every year.

What proportion of cheap bakers are there to the regular traders?

I cannot tell.

What do you take to be the baker's profit on a sack of flour, after journeymen's wages and other expences are deducted?

From a calculation I have made, the baker had a clear profit, on a sack of flour,

	s.	d.
In the year 1797 of	5	$7\frac{3}{4}$
——— 1798 —	5	$4\frac{1}{2}$
——— 1799 —	4	$2\frac{1}{2}$
——— 1800 —	4	$0\frac{1}{4}$
——— 1801 —	3	$10\frac{1}{2}$
——— 1802 —	3	$11\frac{3}{4}$
——— 1803 —	3	7
——— 1804 —	3	4

What do you take to be the amount of the bakings of meat and other things per week, of a baker who bakes twelve sacks of flour per week?

We

We have a great number of bad debts, and we take the bakings as a set-off for them in a year, but they do not amount to the sum the baker loses by bad debts.

What do you calculate the amount of the bad debts of a baker to be, who consumes twelve sacks of flour in a week?

I cannot tell.

Then what is the amount of the bakings of meat and other things, of a baker who bakes twelve sacks of flour per week?

That varies so much in the situation of a baker, that I cannot speak to a certainty, but the majority of such bakings will not come to eight shillings a week.

Do you think your bad debts exceed eight shillings a week?

I think they do.

At what rate do you charge the bakings above mentioned?

The greatest part of them at one penny; some three halfpence.

Has there not been a rise lately?

Some bakers have rose them, but I have not.

Are you prevented by any regulation or statute?

No, we are not; but I conceive that it would be a great accommodation to poor people, to have their victuals baked at one penny per dish.

What allowance do bakers make to chandler's shops, who sell bread?

Some make more, some less. I allow one shilling and three-pence in the pound.

What was the average amount of the Christ-

mas

mas boxes given by a baker who used twelve sacks of flour per week, before Christmas boxes were discontinued?

About ten pounds. I have totally discontinued it, but I believe it is not universally given up, as some few do it underhand, with a view of getting custom.

Do bakers in general employ their journeymen and their ovens in baking rolls and fancy bread, besides the assize bread?

Yes, most part of them do it in a small way. I do very little in that way, and gain very little more by it than if it was all assize bread.

Are you not allowed to fix your own price on fancy bread?

Yes, we are.

What proportion does fancy bread bear to the assize bread you bake in a day?

Not more than one bushel in twelve, and that varies much according to the season of the year.

What is the weight of fancy bread, in proportion to the weight of assize bread?

I bake but little fancy bread, and therefore give the same quantity of dough, nearly, for fancy bread as for assize bread; the small quantity I bake is not an object to me to weigh; it may be four or five ounces in a quartern less than the other; but I understand, where there is a great call for it, they make it less.

When the same quantity of dough is made up into quartern loaves and into fancy bread, which loses most in the oven?

The fancy bread loses double what the other does in the baking.

Is

Is fancy bread included in the average consumption of twelve sacks of flour per week?

Yes.

Is this application to parliament, for an increase of allowance, the act of a few individuals, or of the whole trade, collectively, within ten miles of the Royal Exchange?

It is the act and wish of the whole trade.

Mr. *Richard Satchel*, Brewer, examined.

What price do you charge the baker for your yeast?

Two shillings and sixpence per gallon.

Does the measuring man receive any thing besides?

Yes, he is always allowed to charge three halfpence a gallon for his trouble.

What was the average price of yeast in 1797?

I do not recollect.

Mr. *Joseph Kirkman*, Brewer, examined.

What was the average price of yeast in 1797.

From the 1st of January to the 7th of March I sold it at two shillings per gallon; from the 7th of March to the 15th of July one shilling and sixpence per gallon; from the 15th of July to the 20th two shillings per gallon; from the 20th of July to the 26th of August two shillings and sixpence per gallon; from the 26th of August to the 26th of September two shillings per gallon; from the 26th of September to the 31st of December one shilling and sixpence per gallon;

lon, making, on the average of that year, one shilling and ten-pence per gallon.

Can you account for the great and quick variation in the price of yeast that year?

It was owing to the difference between very hot and very cold weather. We make more yeast from beer in warm than in cold weather.

What was the price of yeast in 1802 and 1803?

In the year 1802 it was two shillings and two pence per gallon, in 1803, two shillings and five pence, and at the present time, two shillings and sixpence, besides the customary allowance of three halfpence to the measuring man.

Do you know of any existing cause why the price of yeast in the present year should be higher than it was in 1797?

I do not.

Does a gallon of yeast, in hot weather, contain as much real yeast as in cold?

Yes, nearly the same.

Is there the same quantity of pure yeast in a gallon when dear as when it is cheap?

No, there is not.

Mr. *George Farr*, clerk to Mr. *Peacock*, a dealer in wood, examined.

What price, per hundred spokes, do you sell wood to the baker?

One pound.

How long has it been at that price?

About six months.

What was the price previous to that?

Nineteen

Nineteen shillings.

Does the price continue the same the whole of the year?

Yes.

What was the price of it in 1797?

I cannot tell; but, in 1798, it was fifteen shillings, and that was the only price that year.

What was it in 1802?

Eighteen shillings.

Are there any dealers in spokes who sell them at a lower price?

Yes, some sell them at seventeen shillings per hundred.

From whence arises the difference?

The genuine spokes that come from the country are part of them split in two, and fit for immediate use.

From what part of the country does Mr. Peacock procure his wood?

From Berkshire.

To what cause is the late increase in the price of wood to be attributed?

To its scarcity.

How do you sell faggot wood?

One pound six shillings per hundred faggots.

Who are the persons that supply bakers with wood?

Wood merchants; they differ from timber merchants, dealing only in fire wood, in coals, and in flour.

Do you find that the use of coals in heating ovens, has reduced the demand for wood?

I have not observed that it has.

Mr.

Mr. *Edward Grose*, clerk to the Bakers' Company, examined.

What was the price of candles in 1797, and what are they now?

I have been at Tallow Chandlers' Hall, and procured the following rates for the price of candles by the dozen pounds. In 1797, the highest price was ten shillings and eight pence, the next ten shillings and four pence and ten shillings, and for one month they were only nine shillings and eight pence. In 1803 they were eleven and sixpence and twelve shillings, and now they are twelve shillings and twelve shillings and sixpence.

Mr. *Edward Gayler*, journeyman to Mr. *Ansell*, Ratcliffe Cross, examined.

What wages did you receive in 1797?

Fifteen shillings a week, with bread, beer, lodging, and a Sunday dinner.

What had you per week in 1803?

Sixteen shillings, with a like allowance.

What have you now?

Nineteen shillings a week, with the same allowance.

Was you in the same class of journeymen in 1797, that you are now?

No, I had then a second hand place, and now I am a foreman.

What was a foreman's wages in 1797?

I do not know.

What does a second hand man have now?

Seventeen

Seventeen shillings is the average price, with bread, beer, and lodging.

Mr. *Richard Venables* examined.

Was you a baker's foreman in 1797?
Yes.
What wages had you?
Sixteen shillings per week, with bread, beer, and lodging.
Had you a Sunday dinner?
No.
What are you now?
I am a foreman at present.
What wages do you receive?
Nineteen shillings a week, with bread, small beer, and a pint of strong beer per day.

Mr. *John Myers* examined.

Was you a second hand man in 1797?
Yes.
What wages did you receive?
Fifteen shillings per week, with bread, beer, and lodging.
What have you now?
Seventeen shillings per week, with a like allowance.
How long have you received that increase of wages?
About two years and four months.
Has this general increase taken place throughout the trade?
I believe it has.

From

From the result of this evidence it would appear, *that, if there is no other profit* attached to this business, than what is publicly avowed, a baker who manufactures twelve sacks of flour in a week, derives only a clear annual income of one hundred pounds, after deducting his expences for all his labour, interest of capital, loss of time, and attendance on his customers; an income, as times are at present, truly contemptible, when compared with the princely revenue of many of our great merchants and tradesmen.

FINIS.

WRIGHT, Printer, St. John's Square.

A Table of the Price of Wheaten Bread, pointing out what the Baker is to be allowed to charge for the Peck, Half-Peck, and Quartern Loaves, according to the Meal Weighers' weekly Reports, to the Lord Mayor of London, of the Corn Factors' Returns of the Quantity and Prices of Wheat sold for the Purposes of making Wheaten Bread, and delivered in the next Week but one preceding such Report, and the Bakers' Returns of the Quantity and Prices of Flour bought and delivered in the Week next preceding such Report.

Wheat per Quarter, in the Market.		Flour per Sack, delivered to the Baker.		Price of the Peck Loaf.		Price of the Half Peck Loaf.		Price of the Quartern Loaf.	
s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
27	0	25	0	1	10	0	11	0	5½
28	8	26	8	1	11	0	11½	0	5¾
30	4	28	4	2	0	1	0	0	6
32	0	30	0	2	1	1	0½	0	6¼
34	8	31	8	2	2	1	1	0	6½
36	4	33	4	2	3	1	1½	0	6¾
38	0	35	0	2	4	1	2	0	7
39	8	36	8	2	5	1	2½	0	7¼
41	4	38	4	2	6	1	3	0	7½
44	0	40	0	2	7	1	3½	0	7¾
45	8	41	8	2	8	1	4	0	8
47	4	43	4	2	9	1	4½	0	8¼
49	0	45	0	2	10	1	5	0	8½
50	8	46	8	2	11	1	5½	0	8¾

of ny Lf.	Weight of Twelvepenny Lf.			Weight of Twelvepenny Lf.		
	Beans.			Mixed.		
dr.	*lb.*	*oz.*	*dr.*	*lb.*	*oz.*	*dr.*
0	62	13	0	52	8	0
0	50	4	0	42	0	0
8	41	13	0	34	15	8
8	35	14	8	30	0	0
8	31	6	8	26	4	0
8	27	15	0	23	5	8
0	25	2	0	21	0	0
8	21	13	4	19	0	8
4	20	14	8	17	7	12
8	19	5	0	16	2	0
4	17	15	4	15	0	0
2	16	11	12	13	15	8
12	15	11	4	13	2	0
8	14	12	4	12	6	0
4	13	15	2	11	10	12
2	13	4	4	11	1	0
0	12	9	0	10	8	0
10	11	15	4	9	15	12
4	10	6	10	9	8	4
4	10	14	12	9	1	8
10	10	7	4	8	11	14
0	10	0	8	8	6	4
12	9	10	8	8	1	0
14	9	4	14	7	12	8
10	8	15	10	7	8	0

of y Lf.	Weight of Twelvepenny Lf.			Weight of Twelvepenny Lf.		
	Beans.			Mixed.		
dr.	*lb.*	*oz.*	*dr.*	*lb.*	*oz.*	*dr.*
0	62	13	0	52	8	0
0	50	4	0	42	0	0
8	41	13	0	34	15	8
8	35	14	8	30	0	0
8	31	6	8	26	4	0
8	27	15	0	23	5	8
0	25	2	0	21	0	0
8	21	13	4	19	0	8
4	20	14	8	17	7	12
8	19	5	0	16	2	0
4	17	15	4	15	0	0
2	16	11	12	13	15	8
12	15	11	4	13	2	0
8	14	12	4	12	6	0
4	13	15	2	11	10	12
2	13	4	4	11	1	0
0	12	9	0	10	8	0
10	11	15	4	9	15	12
4	10	6	10	9	8	4
4	10	14	12	9	1	8
10	10	7	4	8	11	14
0	10	0	8	8	6	4
12	9	10	8	8	1	0
14	9	4	14	7	12	8
10	8	15	10	7	8	0